DOCUMENT RESUME

ED 415 425 CE 075 656

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TITLE Collaborative Learning for Continuous Improvement. Evaluation Final Report. Volume I-IV.
INSTITUTION Cichon (Donald) Consultants, Dover, NH.; Evaluation Research, Newfane, VT.
SPONS AGENCY New York State Education Dept., Albany. Office of Workplace Preparation and Continuing Education.
PUB DATE 1997-11-00
NOTE 197p.
PUB TYPE Reports - Evaluative (142)
EDRS PRICE MF01/PC08 Plus Postage.
DESCRIPTORS Adult Basic Education; *Basic Skills; Cooperative Learning; Curriculum Development; Demonstration Programs; Employer Employee Relationship; *Inplant Programs; Job Skills; Manufacturing Industry; Models; Needs Assessment; *Organizational Change; Participative Decision Making; Problem Solving; Program Development; Program Effectiveness; Program Evaluation; Program Implementation; *Workplace Literacy
IDENTIFIERS *Collaborative Learning; Continuous Improvement; New York

ABSTRACT

This publication consists of four volumes of the evaluation report for a project to provide workplace basic skills education for employees in seven manufacturing companies in New York in partnership with five education agencies. Volume I: "Executive Summary" provides an overview of the evaluation results. Volume II: "Program Goals and Accomplishments" includes a presentation and analysis of findings about the extent to which the project accomplished each goal. The outcomes from individual sites are detailed, and an attempt is made to synthesize these outcomes across sites to present an overall picture of statewide accomplishments. Volume III: "The CICI Model: Vision and Realization" describes the original vision of the Collaborative Learning for Continuous Improvement (CLCI) model and analyzes its strengths, difficulties, and the adjustments made to the vision as the model was implemented over the 3-year period. It concludes with a discussion of what the project learned about workplace education through the experience, lessons that may be helpful for those planning, developing, or thinking about workplace education. Volume IV: "Site Portrayals" provides a detailed picture of each site as a whole, its context, how it implemented the model, what it achieved, and what lessons might be learned from the experiences at that site. This volume is intended to give readers a grounded portrayal of the life of CLCI in its real settings and to enable them to form their own sense of how the model is differently implemented in various contexts. (YLB)

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ED 415 425

Collaborative Learning for Continuous Improvement

Evaluation Final Report

Volume I: Executive Summary

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for
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Office of Workforce Preparation
New York State Education Department

November 1997

CE 075 656

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PREFACE and ACKNOWLEDGMENTS

The Collaborative Learning for Continuous Improvement (CLCI) project was conducted under a grant from the U.S. Department of Education's National Workplace Literacy Program to the New York State Education Department from November 1994 through October 1997. The grant was to provide workplace basic skills education for employees in seven manufacturing companies across the state in partnership with five education agencies.

This is one of four volumes of an evaluation report for the project. **Volume I: *Executive Summary*** provides an overview of the evaluation results. **Volume II: *Program Goals and Accomplishments***, includes a presentation and analysis of findings about the extent to which the project accomplished each goal. There the outcomes from individual sites are detailed and an attempt is made to synthesize these outcomes across sites to present an overall picture of statewide accomplishments. **Volume III: *The CLCI Model: Vision and Realization***, describes the original vision of the model and analyzes its strengths, difficulties and the adjustments made to the vision as the model was implemented over the 3-year period. Volume III concludes with a discussion of what the project learned about workplace education through the experience, learnings that may be helpful for those planning, developing, or thinking further about workplace education. **Volume IV: *Site Portrayals***, provides a detailed picture of each site as a whole, its context, how it implemented the model, what it achieved, and what lessons might be learned from the experiences at that site. This volume is intended to give readers a grounded portrayal of the life of CLCI in its real settings, and perhaps to afford readers the opportunity to form their own sense of how the model is differently implemented in various contexts.

The work of the CLCI project involved the continuous efforts over a 3-year period of several individuals who participated regularly in the project's Central Planning Team, most of them in addition to their work at local sites. These included:

- Bob Knower of the New York State Education Department
- Paul Jurmo of Learning Partnerships in New Jersey
- Mike Armstrong and Margaret Shirk of Hudson Valley Community College
- Paula Hayes of the Onandaga-Cortland-Madison BOCES
- Karl Kania and Tom Wager of the Rochester City Schools Family Learning Center
- Bev Zier and Diane Spang of the Wayne-Finger Lakes BOCES
- Stan Swider of the Schuyler-Chemung-Tioga BOCES.

Others made significant contributions during their involvement in limited parts of the project, namely:

- Judy Lees of Hudson Valley Community College
- Sid Mann and Fran Simone of the Schuyler-Chemung-Tioga BOCES
- Chris Schwenker, Sheryl Grana, Joe Horton, Tricia Lum, Andy Mendola, Traci Panaro and Gina Porter of the Rochester City Schools Family Learning Center
- Sue Follinsbee of ABC Canada

- Ed Cohen-Rosenthal of the Cornell University School of Industrial and Labor Relations.

Additionally, representatives of the business partners spent considerable time working with the education partners, adjusting the efforts at their companies to effect some mutual adaptation with the project, sharing their thinking about workplace education with us as evaluators, and sometimes participating in statewide activities, including the CPT. These include:

- Vince Partisano of Albany International Corporation, East Greenbush
- Linda Holland, Marv Meissner and Bonita Lindberg of Albany International, Homer
- Al Zwack and Colleen Hyatt of Albany International, Menands
- Patti Campbell and Bob Trouskie of UAW Local 1097 at Delphi Energy Systems, Rochester
- Cynthia Schwab of EGG Wright Components, Phelps
- Mike Werner of Elmira Stamping, Elmira
- Joel Cummings, Maryann Lesnieski, Donita Mayes, Christie Nunn and Shyrl Orrego-Scalice of Eastman Kodak Corporation, Rochester.

Making a different kind of contribution was Gordon Quimby, who provided editorial review to the nearly final version of these reports. His lack of involvement in workplace education was particularly valuable in translating much of the shorthand terminology we've all come to use without thinking about who outside our circles understands it. We hope that we took his suggestions often enough and used them well.

We appreciate the efforts of all of the people above and enjoyed the opportunity to work with them during the project. They helped make the work most stimulating and enjoyable. In addition to the thinking they did to help develop and implement the project, their comments and questions helped us stimulate and clarify our own thinking. Thus, they can be said to have contributed to many of the ideas in this series of reports. As the ones who put it together on paper, however, we take responsibility for any errors or misinterpretations herein.

Don Cichon
Laura Sperazi

Introduction

The *Collaborative Learning for Continuous Improvement* (CLCI) was a workplace education project funded by a grant from the U.S. Department of Education's National Workplace Literacy Program to the New York State Education Department. The project was funded from November 1994 through October 1997. It consisted of partnerships between seven manufacturing companies and five education service providers across the state. One of CLCI's first extensive tasks was to develop a set of formal goals for the program through use of a project-wide participatory process. From a first draft in March 1995 through final form in October 1995, the following goals were set:

1. Provide a continuous improvement, customer-driven structure to support EPTs in attaining their goals.
2. Develop and evaluate/test the Collaborative Learning for Continuous Improvement model of workplace education that integrates a workplace needs analysis (WNA), stakeholder planning and evaluation process, problem-posing curriculum, and portfolio assessment in ways that are appropriate for each site. Specifically:
    A. To integrate the education program within the broader workplace culture by conducting and utilizing the results of a WNA;
    B. To guide project planning, implementation, and evaluation at the local site level through a stakeholder-based team process; and
    C. To develop a curriculum and instructional model which incorporates a problem-posing framework and portfolio assessment.
3. Demonstrate results of the CLCI model on:
    A. workers (as evident in SCANS[1] competencies/skills and other benefits, e.g., improved self-confidence)
    B. the workplace (as evident in production or service improvements, Return on Investment [ROI] and other impacts, such as improved high-performance characteristics)
    C. business/union commitment to worker education.
4. Promote continuation of the project at existing sites and expand to new sites in New York State.

The CLCI Model

The seven partnerships, or sites, operated their programs under the guidance and coordination of a Central Planning Team (CPT) composed of representatives of each site and four central team members, one from the NYSED, one outside curriculum consultant, and two external planning and evaluation consultants. Along with the goal setting process of the first few months, the CPT clarified for itself that CLCI is a workplace education program model that would be simultaneously developed and tested. The main elements of the CLCI include:

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[1] Secretary's Commission on Achieving Necessary Skills, U.S. Department of Labor, 1989 – a set of competencies and foundation skills widely promoted as necessary for competent job performance in today's world.

Educational Planning Team (EPT). Each site begins its work in the model by creating a governing body composed of all stakeholder groups, which meets regularly. Typically the EPT would include a site coordinator and/or teachers; management representatives -- either upper-level, supervisors, or both; floor worker or operator representatives of those who would receive instruction through the program; and union representatives where the program operates in a union shop. EPTs are expected at least to set program goals, oversee program development and implementation, and monitor progress through internal evaluations.

Workplace Needs Assessment (WNA). Before it sets its goals, the EPT conducts a Workplace Needs Assessment. The WNA is a process for assessing the full scope of workplace needs, at both the employees' skills and the organizational levels, including, but not limited to, those that the workplace education program might be expected to meet. The process helps the EPT to make realistic judgments about what a literacy program can and cannot accomplish, helps to facilitate the integration of workplace and education goals, and introduces educational staff to the workplace, in particular to workers, supervisors, and managers in their work roles outside the instructional venue. The WNA also helps the EPT to identify specific workplace problems, which can serve as foci of instruction in the problem-posing curriculum (described below).

Instructional Program. Two key instructional features are singled out for special attention in the model: problem-posing curriculum and student portfolio assessment.

Problem-posing curriculum. In the CLCI model curriculum development is driven by the identification of workplace problems for which workers generate solutions during the course of instruction. In that process students are expected to investigate the problem and potential solutions, test some of them, and communicate with management about them. The solutions are offered to management with the hope that some direct application to the workplace will be made, and, in the best possible case, significant return on investment will result. Work on the problems is the avenue for addressing more traditional basic skills instructional activities as needed in the context of the problem. Of all the CLCI elements, this one seems to have been modified the most during actual implementation. Those modifications are discussed more fully in each of Volumes II – IV.

Portfolio Assessment. The CLCI model includes the use of portfolio assessment. This tool is especially appropriate for the problem-posing approach set out in the proposal. Individual portfolios may include documentation of more traditional basic skills' gains, but they may also contain documentation of problems, activities related to investigating them, solutions, management responses, applications, and attainment of SCANS skills and competencies. The model expanded to include use of class portfolios as well as individual portfolios.

Evaluation. The CLCI conducts two levels of evaluation. The first level is carried out by the EPTs based on program-generated goals, the results of which are documented in "Site Evaluation Portfolios." The site portfolios are submitted to the external evaluators and feedback and technical assistance are provided to site personnel to help with their evaluations. The external evaluators conduct the second level. They use the information contained in the site portfolios to supplement their own data collection.

Outcomes. The general categories of outcomes of interest to the CLCI are those concerning the worker, the workplace, and the business/union commitment to workplace education. Outcomes within any category are not prescribed at the statewide level. Some suggestions and examples are provided, though specific outcomes to assess within each category are up to the local EPTs as part of their goal-setting processes. The external evaluators attempt to develop the best synthesis of outcomes across the statewide project.

Findings – Goal Accomplishment

Overall, the development and testing of the CLCI model, the second goal among the four, is considered to show the greatest degree of accomplishment. This is the area in which most of the project efforts took place and where almost all indicators were met by most local sites. The first and third goals, support structure and demonstrable impacts, were also accomplished at a high level. Accomplishments in the fourth, promotion of the program's continuation, were not as direct or clear as those in the other goal areas. A brief summary and discussion of the major accomplishments and difficulties in each goal area follows.

Goal 1, the customer-driven support structure, is essentially embodied in the CPT. The CPT met regularly and evolved into the official stakeholder-based, participatory governing body for the entire project. Most members appreciated the opportunity to participate in the group. Participation provided them with the valued sense of belonging to a larger effort and working toward a vision larger than their day-to-day operations, among several other benefits described in Volume II. For most of its term the CPT performed well the major functions of setting goals, establishing indicators, monitoring progress toward goals, self-correcting when needed, and planning site support activities.

The CPT fell short, however, of its ideal operation. Participation of business/union partner representatives was almost nonexistent, despite a few concerted efforts by some CPT members to increase their involvement. The lack of timeliness and continuity of written meeting proceedings may have been factors inhibiting the group from being as effective as it could have been. Finally, the momentum of the group waned during the project's last eight months. This may have resulted because most local sites had their programs operating very well by then and no longer needed the support they sought and received from the CPT earlier. Additionally, those sites with little or no activity for most of the third year may have had reduced interest in or reduced hopes for further accomplishments. In any case, the group lost momentum during the time when it might have been appropriate to more strategically pursue the goal of program continuation.

Goal 2, to develop and test the CLCI model, consisted of four major components and their integration. The first component was the WNA, which was conducted fairly extensively in six of the seven sites near the project's outset. The WNA procedures used at the sites were usually of the broad scope articulated in CLCI's ideal. These procedures had both the explicit outcome of identifying reasonably clear needs and the implicit benefit of building the foundation of the partnership between the educators and their respective companies. This foundation, attained through extensive discussions at all management, union and operations levels, established the relationships, interaction protocols, and at least a start in mutual understanding

that helped integrate the workplace education program into the company culture. With that foundation, both partners' understandings of the workplace needs were much clearer and more widely shared, and decisions about programming and instruction came much easier and with minimal logistical problems. Further, the problem-posing curriculum part of the model was enhanced because the learning teams' "solutions" to problems could be communicated to management through the communication paths paved by the WNA.

While six of the seven sites did conduct an extensive WNA, the site that conducted the more limited one provides an example of how the local program and the total project learned from that experience. That is, this case suggests that implementing a truncated WNA can be a first step toward the complete process. That first step of a limited needs assessment, and a limited program following from it, gave time to build a level of comfort among the various stakeholders. This time, and the successes of the limited program, allowed the union and management to agree to expand the scope of the WNA in subsequent cycles.

The EPT was the next component of goal 2. The EPTs functioned quite well at most sites. An ideal set of EPT specifications could be developed to include such features as a minimum of monthly meetings, near perfect participation of each stakeholder group at each meeting, active worker participation in the deliberations, formal and regular goal assessment and reporting, and so forth. In actuality, however, another key element of the model was to integrate this program with the company culture. That element made it appropriate that the EPT adjust from those logistical ideals to fit into the circumstances of the company's organizational climate. Specific adaptations made by the CLCI sites are detailed in Volumes II and III.

The one part of the EPT functioning that most often presented difficulty was worker participation. Some workers experienced difficulty being released from operations to attend meetings. Some were unable, when attending, to be truly active participants. Active participation was less of a problem in the workplaces that had previously adopted participatory work teams. Another problem, though less frequent than the first, was management participation. Most EPTs had participation by one or more managers, but this participation was not always as consistent, regular, or active as needed to effectively help the group with its deliberations and decisions.

Planning and conducting the instruction had two key subelements: problem-posing curriculum and student portfolio assessment. The problem-posing model was considered a great success, in that most sites implemented the indicators for this part of the goal. The instructors and participating employees developed curricula out of worker-generated operations problems, saw the problems through to closure in proposed solutions, obtained at least an open-minded response from their communications with management, and, in more than half the cases, implemented the solutions fully or with modification. The details of the types of problems addressed and what was done about them are provided in Volume II. As the project developed, what constituted a "problem" for this model became a matter of ongoing, lively discussion. The understanding that emerged among the CPT seemed to be that a "problem" may be of three types:

1. specifically production-related -- e.g., old conveyor system produces high waste and injury rates

2. a broader issue that is related to the workplace -- e.g., worker benefits program
3. an unsatisfactory situation whose improvement bears fairly directly on workplace improvement -- e.g., better knowledge of and skill with Statistical Process Control.

One of the chief difficulties with developing and implementing the problem-posing curriculum was the uncertainty for the teachers of developing and teaching something new for which there was little, if any, precedent in their training or experience. Near the start, teachers didn't always feel sure of what they were doing with the curriculum and instruction. They frequently had to adapt to new roles as facilitators to draw ideas out of their classes and to build upon those ideas for a longer-range plan -- not just instruct in fairly well defined sets of skills or information. To their credit, most teachers in the program worked through those uncertainties.

A second difficulty was that sometimes the floor worker participants did not have confidence in their abilities to be effective in addressing job-related problems. They often thought of that as a function of managers and engineers. Thus, the front-line workers also had to learn new roles. Concurrently, sometimes their managers and engineers also had to learn new roles, those of listening and giving credibility to the operators.

The student portfolio assessment part of Goal 2 was less successful across the entire project. Only two sites used such assessments to a significant extent at the individual student level for the integration of assessment and learning, a careful assessment and presentation of evidence keyed to course objectives, progress assessments, and development of individual learning plans. Those two sites used the portfolio assessment only in more conventional basic skills in the workplace context, not in the more problem-posing courses. The other sites that did attempt to use portfolio assessment did so with the portfolios as a repository of information for individuals or groups, information that was perhaps scanned to get a holistic sense of the progress and needs of the group. During the early stages of the CLCI, site personnel discovered that most of them had too superficial knowledge of portfolio assessment to apply it to adults in the workplace settings. Moreover, training resources were too limited to allow this project to obtain the additional training needed. Even those staff who had training available to them from other sources found the application of portfolio assessment concepts to the team-based problem-posing curriculum difficult or impossible.

For the third goal, demonstration of results, this project had an impact on the participating workers, workplaces, and, to a lesser degree, business and union commitment to workplace education. The evidence for worker impacts generally focused around communications skills, problem-solving strategies, teamwork, computer skills, and math skills -- all in their very specific work contexts. Most of that evidence was anecdotal in reports from workers, their teachers, supervisors, and company and union managers, though a few surveys assessing in-class learning and follow-up use on the job provided some systematic data. While some gains were demonstrated, no standards or comparison base exist for workplace education. It is also not possible to compare or quantitatively combine results across sites in this project because each site's outcomes were customized in line with their respective program objectives. As a result, one cannot say how strong these impacts were.

The evidence for the workplace impacts was substantial, though uneven across the sites. As detailed in the findings of Volume II, anecdotal reports abound detailing smoother work flow, fewer defects, increased morale and confidence, better interactions between operators and supervisors and managers, and cost savings. Two companies provided actual workplace data that relate somewhat clearly to their classes in this project. Both of those data sets show large positive outcomes in cycle time, scrap reductions, and timely customer order fulfillment. The results provided by the sites ranged from about 150% to over 500% improvement. Increases of these magnitudes after training programs are at the low end of what are generally published in research reporting workplace training effects. Those published research results, however, are for targeted skills training programs (e.g., new sales systems, new machine operations, new supervisory approaches, etc.), not for more general training such as CLCI's. All other things being equal, the targeted skills programs generally produce more pronounced impacts than more general education or training of the type done in CLCI. Thus, CLCI's reported impacts seem quite strong.

One of the desired outcome areas was the business/union commitment to workplace education. The evidence of the extent of commitment was uneven across sites. Most sites report that the companies or union had a high commitment to worker education at the outset of the project and that commitment remained high. There was generally a marked change in the company or union management perspective on workplace education, however. These companies saw the benefit of having their education programs conducted in a way that was integrated into the broader company's organizational development and restructuring activities rather than piecemeal to address only targeted work skills. One site created a permanent structure to integrate the participatory aspects of the CLCI into their broader education and training function. Another considered committing funds to hire a full-time educator to continue providing similar programs.[2].

The efforts regarding the fourth goal, program continuation, were mostly informal and incremental. That is, many instances were seen where the participating education partner staff made changes in the way they planned and conducted their other workplace education and workforce preparation programs. They incorporated the more participatory, needs assessment, and problem-posing curriculum aspects of CLCI. Some of the business and union partners made either clear structural or more subtle changes in the way they govern, plan, and conduct their education and training programs. No explicit continuation of the whole model was in place or planned by any participating company, however, and the strategic plans of the CPT to promote such continuation did not proceed very far. Efforts are still planned in pursuit of this goal, so perhaps a 6-month or 1-year follow up might provide evidence of more accomplishment for the model's continuation in the existing companies or in others across the state.

Reflections on the CLCI Model

A major conclusion drawn from the CLCI model is that an education program can help to leverage organizational change as it addresses some worker basic skills needs. Significant workplace results were demonstrated within the model development period. There are many

[2] The decision on this proposal is still pending as of this writing.

examples of results offered throughout Volumes II and III of this report. One particularly poignant example is from a site in which a portion of the plant that is typically neglected and identifies itself as marginal -- the 3rd shift -- became much more integrated into the company life as a result of a communications course conducted at night by an instructor. When engineers and designers, as part of a course activity, spent some time with 3rd shift operators, the operators began to feel that they counted more – both as people and as members of their work community. These operators now participate in design decisions, something they could not believe the company would allow before the program. There is also evidence that the results of one small course may impact a company over time. More than two years after its conclusion, results of that first communications course in this site were still evident.

It would be interesting to see how many more solutions workers might transform into greater ease or efficiency of work, savings for the company, or other benefits for the company or themselves if the problem-posing project continued. Workers might become even more creative in some sites if given continued support to solve problems and to improve themselves and their conditions at work.

The CLCI model did not generally address the conventional basic skills to a significant degree, although more sites did so later in the three-year period. As a result no conclusions can be drawn about now the model would work in companies where conventional basic skills education is a more urgent need than it was in these. Some of this project's participating workplaces had workers with very low basic skills, and some parts of the model worked at those sites. These sites did not, however, address the conventional basic skills as their primary focus.

Other key learnings from the CLCI model overall are summarized below as more particular "strengths" and "difficulties."

Strengths

• The CLCI model provides a dynamic structure to two different types of organizations -- business and education -- through which both can accomplish something that workers, companies, and labor organizations need: improvement of skills and work conditions. The EPT and WNA provide forums in which the two organizations, sometimes with disparate cultures, can communicate safely and effectively and, presumably, reach agreement about how to run a good program.

• The EPT is an essential component for any workplace education program that is to be integrated with other parts of the company's system or culture, regardless of whether the program implements other parts of the model or not. No participating site representative could imagine running a program without the EPT "crucible" in which program stakeholders meld their goals, even it does not fully carry out the other functions.

• The WNA sets the stage for a strong, realistic program that is well integrated into company culture. It helps to mitigate against promising too much with the program, directly grounds what educators offer in what workers and managers and union representatives have identified as their most pressing needs, and facilitates educators' entry into workplace culture.

• Problem-posing curriculum can be interpreted and implemented in different ways -- from a broad and elusive problem like poor communications between managers and workers to something as specific as improving SPC skills. What is important is not how large or small the problem is but how important workers think it is and how ready management is to accept solutions from workers. There is a trajectory from the EPT to the WNA to the problem-posing curriculum that brings closure to a problem and, potentially, real workplace application. That trajectory, coupled with the interaction of elements in the model, has a value that is greater than any one part alone. However, any part or parts of the model can be used to achieve good results. For example, a WNA might be conducted by an EPT that would lead to learning activities that are not problem → solution → application-oriented.

• The CPT is important for a multi-site project. It is a forum in which valuable information is shared, new ideas are generated, and members are motivated by the psychological support of belonging to a larger group effort with common goals. Further, the CPT can model the high-performance organization for the benefit of participating sites.

• The CLCI model is open. It encourages experimentation with new forms of instructional delivery, especially those that break down the distinction between work, learning, and assessment.

Difficulties:

• Some personnel, especially managers, are critical of some components -- particularly, for example, the EPT, WNA, and CPT – because they do not see these components as "value-added." Some personnel at management or floor levels need to go through the experience of a participatory, problem-posing instructional program before recognizing its value. It is not always easy to integrate a CLCI model with company culture if educators are more advanced in participatory, high performance practice. When educators drive the model, companies can feel it is an intrusion.

• It is helpful if personal incentives for workers are evident, especially when the program is not delivered on company time. Otherwise the model can be interpreted as benefiting the company through applied problem solving, without benefiting workers.

• Increased worker skills can lead to new types of interactions between floor workers and engineers and managers, with new expectations by floor workers for participatory responses. If managers are unprepared for new behaviors, unexpected friction may ensue.

• Some educators think that a problem-posing curriculum is limiting. A WNA may lead to a variety of learning activities that are not necessarily problems and instructional staff should remain open to them, even if they do not fit the definition of a "problem." The model focuses on "problems" to insure that workers have real opportunities to apply new learning on the job, not to limit instructional options.

• There are limits to the technical skills that a traditionally trained adult education teacher will be able to teach students. Adult educators know how to develop contextual curriculum and how to

solve problems, but they are not machinists or quality process experts. They should not be expected to take the place of subject matter expert or technical trainers.

• The WNA might raise issues that educators cannot easily address. If educators are not "insiders" then they can work to raise the consciousness of company personnel about the need to address important issues. Educators need to learn to assess the limits of their roles and responsibilities. In a related vein, managers and supervisors are often caught in a tide of organizational change and do not always move easily with those changes. It may be difficult to apply even simple worker generated solutions to curriculum "problems" in workplaces where managers and supervisors are resistant to or unprepared for change.

Conclusions

This project began with a list of discrete assumptions or principles in the funding proposal that it would try to implement. These principles, along with the participating staff and companies, were the unassembled building blocks for the project. Through the good thinking and experiences of the staff, interaction with and information from outside "experts," and continued reflective experimentation and practice, the building blocks were built into a dynamic, integrated CLCI model. This model is useful for those workplace education programs that attempt to integrate worker education with the total corporate culture, as promoted by Senge in his "Fifth Discipline" for learning organizations[3]. The CLCI model is also useful in companies that have a belief in, or are at least open to, the practice of worker participatory approaches and empowerment, or that have a structure that is consistent with high-performance corporate development. Those who worked in this project have contributed to the development of this model through working in and with such organizations. The hope is that others will borrow, adapt, refine and revise this model for the further benefit of workplace educators and workers and their companies.

The workplace education projects funded by the U.S. Department of Education, of which the CLCI is one, had a dual intention. One was to conduct activities that would have positive impacts on the participating workers and companies. This project demonstrated that it met that intention. The other intention was, as a demonstration project, to develop the knowledge base about worthwhile practices in workplace education. The primary strengths of the CLCI in its development and testing of the model (Goal 2 above), and the strong interest in its operation and results in national venues, make this project a valuable contribution to the field of workplace education.

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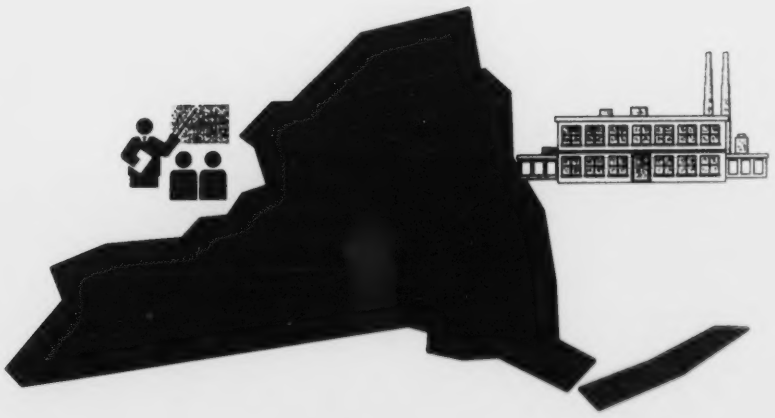
[3] Peter Senge, *The fifth discipline: the art & practice of the learning organization*. New York: Doubleday, 1990.



Collaborative Learning for Continuous Improvement

Evaluation Final Report

Volume II:

Program Goals and Accomplishments

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This is one of four volumes of an evaluation report for the project. **Volume I: *Executive Summary*** provides an overview of the evaluation results. **Volume II: *Program Goals and Accomplishments***, includes a presentation and analysis of findings about the extent to which the project accomplished each goal. There the outcomes from individual sites are detailed and an attempt is made to synthesize these outcomes across sites to present an overall picture of statewide accomplishments. **Volume III: *The CLCI Model: Vision and Realization***, describes the original vision of the model and analyzes its strengths, difficulties and the adjustments made to the vision as the model was implemented over the 3-year period. Volume III concludes with a discussion of what the project learned about workplace education through the experience, learnings that may be helpful for those planning, developing, or thinking further about workplace education. **Volume IV: *Site Portrayals***, provides a detailed picture of each site as a whole, its context, how it implemented the model, what it achieved, and what lessons might be learned from the experiences at that site. This volume is intended to give readers a grounded portrayal of the life of CLCI in its real settings, and perhaps to afford readers the opportunity to form their own sense of how the model is differently implemented in various contexts.

The work of the CLCI project involved the continuous efforts over a 3-year period of several individuals who participated regularly in the project's Central Planning Team, most of them in addition to their work at local sites. These included:

- Bob Knower of the New York State Education Department
- Paul Jurmo of Learning Partnerships in New Jersey
- Mike Armstrong and Margaret Shirk of Hudson Valley Community College
- Paula Hayes of the Onandaga-Cortland-Madison BOCES
- Karl Kania and Tom Wager of the Rochester City Schools Family Learning Center
- Bev Zier and Diane Spang of the Wayne-Finger Lakes BOCES
- Stan Swider of the Schuyler-Chemung-Tioga BOCES.

Others made significant contributions during their involvement in limited parts of the project, namely:

- Judy Lees of Hudson Valley Community College
- Sid Mann and Fran Simone of the Schuyler-Chemung-Tioga BOCES
- Chris Schwenker, Sheryl Grana, Joe Horton, Tricia Lum, Andy Mendola, Traci Panaro and Gina Porter of the Rochester City Schools Family Learning Center
- Sue Follinsbee of ABC Canada

- Ed Cohen-Rosenthal of the Cornell University School of Industrial and Labor Relations.

Additionally, representatives of the business partners spent considerable time working with the education partners, adjusting the efforts at their companies to effect some mutual adaptation with the project, sharing their thinking about workplace education with us as evaluators, and sometimes participating in statewide activities, including the CPT. These include:

- Vince Partisano of Albany International Corporation, East Greenbush
- Linda Holland, Marv Meissner and Bonita Lindberg of Albany International, Homer
- Al Zwack and Colleen Hyatt of Albany International, Menands
- Patti Campbell and Bob Trouskie of UAW Local 1097 at Delphi Energy Systems, Rochester
- Cynthia Schwab of EGG Wright Components, Phelps
- Mike Werner of Elmira Stamping, Elmira
- Joel Cummings, Maryann Lesnieski, Donita Mayes, Christie Nunn and Shyrl Orrego-Scalice of Eastman Kodak Corporation, Rochester.

Making a different kind of contribution was Gordon Quimby, who provided editorial review to the nearly final version of these reports. His lack of involvement in workplace education was particularly valuable in translating much of the shorthand terminology we've all come to use without thinking about who outside our circles understands it. We hope that we took his suggestions often enough and used them well.

We appreciate the efforts of all of the people above and enjoyed the opportunity to work with them during the project. They helped make the work most stimulating and enjoyable. In addition to the thinking they did to help develop and implement the project, their comments and questions helped us stimulate and clarify our own thinking. Thus, they can be said to have contributed to many of the ideas in this series of reports. As the ones who put it together on paper, however, we take responsibility for any errors or misinterpretations herein.

Don Cichon
Laura Sperazi

Volume II: Program Goals and Accomplishments

CONTENTS

	Page
I. Project Background	1
The CLCI Model	3
The Sites	8
II. Evaluation Activities	11
III. Results – Accomplishment of Goals	12
Goal 1. Provide structure to support EPTs	12
Goal 2. Develop and evaluate/test the CLCI model	16
2A. WNA	16
2B. Stakeholder-based team process	19
2C. Curriculum with problem-posing framework and portfolio assessment	23
Goal 3. Demonstrate results of CLCI model	31
Goal 4. Promote program continuation	40
IV. Summary and Discussion	42

APPENDIX. Selected Worksheets from Site Evaluation Portfolio Manual

Volume II: Program Goals and Accomplishments

LIST OF TABLES AND FIGURES

	Page
Figure 1. CLCI Model	4
Table 1. Site Descriptive Summary	9
Table 2. Median and Range of Costs per Participant and Participant Hour	10
Table 3. Status of EPT Meetings	20
Table 4. Summary of Sites' Results for Problem-Posing Curriculum Indicators	24
Table 5. Key Features of Student Portfolios by Site	30
Table 6. Summary of Sites' Results on Worker and Workplace Impacts	33
Table 7. Site E, Thru-Put in Workdays, Deviations from Average	35
Figure 2. Site E, Thru-Put in Workdays, Deviations from Average	35
Table 8. Site E, Percent of Customer Shipments Early or On Time, Deviations from Average	36
Figure 3. Site E, Percent of Customer Shipments Early or On Time, Deviations from Average	36
Table 9. Summary of Sites' Results on ROI and Commitment Impacts	38

I. Project Background

The *Collaborative Learning for Continuous Improvement* (CLCI) project was a workplace education activity funded by a grant from the U.S. Department of Education's National Workplace Literacy Program (NWLP) to the New York State Education Department (NYSED). The project was funded from November 1994 through October 1997[1]. It consisted of partnerships between seven manufacturing companies and five education service providers across the state. The seven partnerships, or sites, operated their programs under the guidance and coordination of a Central Planning Team (CPT) composed of representatives of each site and four central team members -- one from the NYSED, one outside curriculum consultant, and two external planning and evaluation consultants.

The major activities of the project's first six months included orientation and training for all site staff members, generally as a group, to develop a common understanding and to build a mutually supportive network. This period also included site-specific planning and evaluation activities to build a firm foundation for the sites' more direct educational delivery during the remainder of the project. Initial direction for the early orientation and training came from several ingredients embedded in the proposal to the National Workplace Literacy Program:

- curriculum development based on an organizational needs analysis
- a problem posing curriculum focusing on actual workplace situations
- whole language instruction
- writing as a process
- metacognitive skill development
- integration of Secretary's Commission on Achieving Necessary Skills (SCANS) competencies and foundation skills
- portfolio assessment
- assured transfer of skill development from classroom to workplace
- a study to determine the feasibility of infusing technology in these promising practices
- a "pay for knowledge" worker incentive policy
- an evaluation design to measure return on investment
- integration of site internal and project-wide external planning and evaluation processes.

[1] Plus a 6-month no-cost extension beyond that point to conduct dissemination activities.

A number of the foregoing ingredients, especially the one involving the SCANS competencies and skills, imply that this project could go beyond the boundaries most conventionally thought of as "basic skills." That is, basic skills in American education generally refer to basic reading, writing, speaking and arithmetic skills. This conception has extended to the field of adult basic education in formal ways, and to workplace literacy, very often including an English as a Second Language component. The NWLP quite clearly limited the curriculum and instruction under its previous grant programs to the conventional basic skills. With the acceptance of SCANS and its view of the legitimacy and importance of such skills as problem-solving, teamwork, reasoning, decision-making, responsibility, self-esteem, information management and processing, and others as basic, considerably wider range was opened in what could be addressed in a workplace education program. That wider range was accepted for this project.

An overarching principle of the project was that all participating businesses were involved in some stage of movement toward becoming high-performance workplaces[2]. The participating partnerships were thus all committed to developing programs and training to support the businesses' ongoing restructuring initiatives. As a result, the more specific principles from the proposal were intended to fit into and further promote those restructuring efforts, and the elements were to be implemented in a way that modeled high-performance practices. That is, the project was to be a high-performance workplace education program -- thus the adopted name *Collaborative Learning for Continuous Improvement*.

In line with the chosen mode of operation, a Central Planning Team, representing all stakeholders, emerged as the governing structure near the end of the start-up period. One of the first tasks of the group was to articulate the project's goals. The goals grew out of the initial proposal's principles and from the emerging practices as sites attempted to implement those principles during the first six months. From a first draft in March 1995 through final form in October 1995, the following goals were set for CLCI:

1. *Provide a continuous improvement, customer-driven structure to support EPTs in attaining their goals.*

2. *Develop and evaluate/test the Collaborative Learning for Continuous Improvement model of workplace education that integrates a workplace needs analysis (WNA), stakeholder planning and evaluation process, problem-posing curriculum, and portfolio assessment in ways that are appropriate for each site. Specifically,*

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[2]Ray Marshall, former U.S. Secretary of Labor, delivered at conference on "High Performance Work and Learning Systems," Washington, D.C., September 26-27, 1991.

A. To integrate the education program within the broader workplace culture by conducting and utilizing the results of a WNA;
B. To guide project planning, implementation, and evaluation at the local site level through a stakeholder-based team process;
C. To develop a curriculum & instructional model which incorporates a problem-posing framework and portfolio assessment.

3. *Demonstrate results of the CLCI model on:*
   A. workers (as evident in SCANS competencies/skills and other benefits, e.g., improved self-confidence)
   B. the workplace (as evident in production or service improvements, return on investment [ROI] and other impacts, such as improved high-performance characteristics)
   C. business/union commitment to worker education.

4. *Promote continuation of the project at existing sites and expand to new sites in New York State.*

The CLCI Model

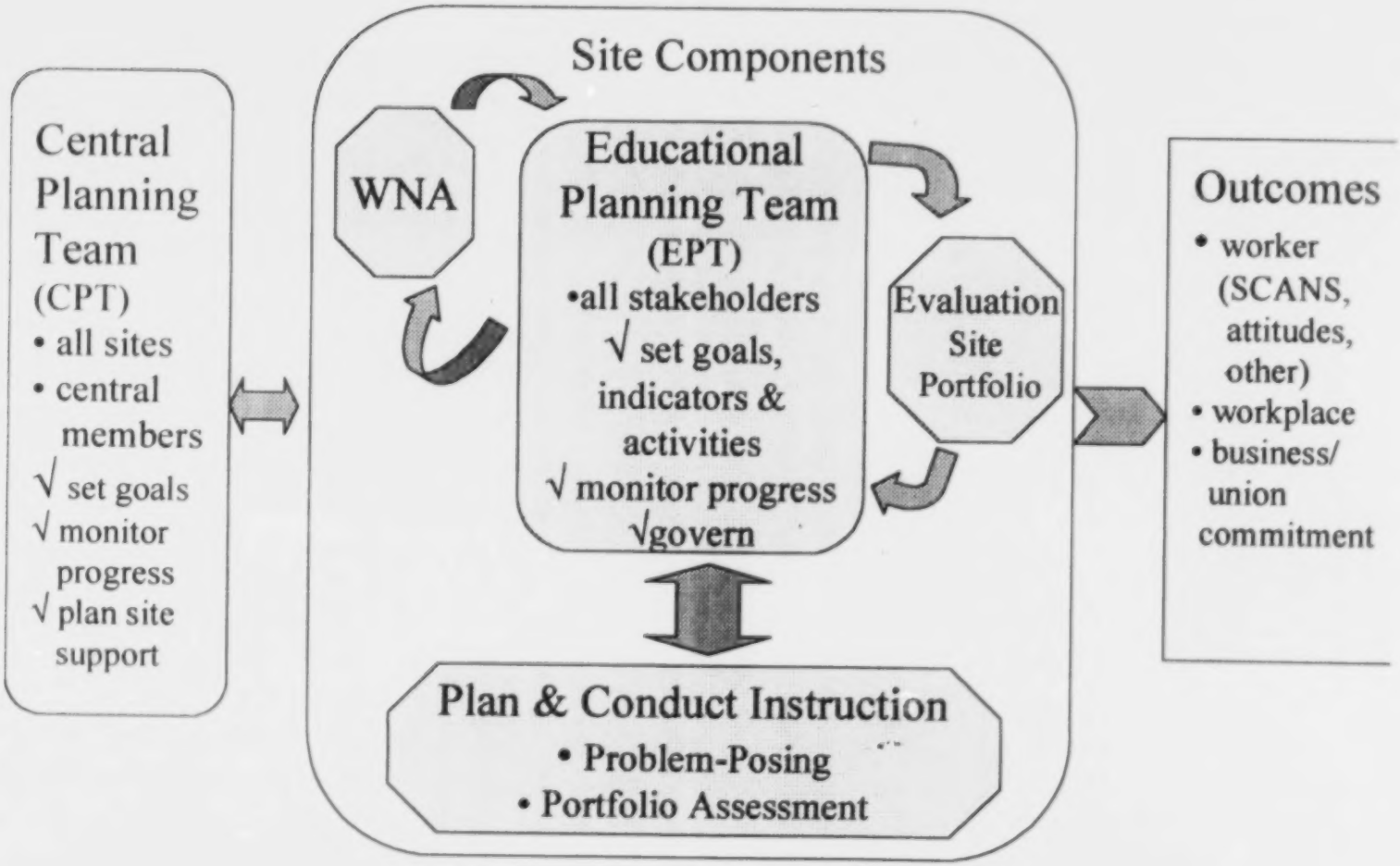
Along with the goal setting process of the first few months, the CPT clarified for itself that CLCI is a workplace education program model that is being simultaneously developed and tested. The various goals and indicators which guide the work of CLCI and the external evaluation are attempts to make the many facets of the model operational. The main elements of the CLCI, and some of the primary relationships among the elements, are summarized in graphic form in Figure 1, and are described briefly below. A more extensive description of the model is presented in Volume III.

The governance structure for the entire statewide project is **the Central Planning Team (CPT)**. As mentioned at the outset, the seven sites operate their programs under the guidance and coordination of the CPT. Democratic representation of local sites' views at the CPT level is intended to insure that the project will develop dynamically with imaginative discussion or debate about what it can accomplish and how services can best be delivered at the site level. The CPT sets the overall goals, guides sites in general program development, and monitors progress through the external evaluation and its consideration of the results.

At the site level, the key model components are:

Educational Planning Team (EPT). Each site begins its work in the model by creating a governing body composed of all stakeholder groups which meets regularly. Typically this would include a site coordinator and/or teachers; management (either upper-level, often the Human Resources Director, or supervisors, or both); workers who are among the pool of those to receive instruction through the program; and union representatives where applicable. Ideally,

Figure 1. CLCI MODEL



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democratic representation of stakeholders' views insures that sites develop dynamically, with discussion about the various perspectives to inform what the site's program can accomplish and how it can best do so. EPTs are expected at least to set program goals, oversee program development and implementation, and monitor progress through internal evaluations.

Workplace Needs Assessment (WNA). Before setting final goals, the EPT conducts a Workplace Needs Assessment.[3] This type of WNA is a process for assessing a wide scope of workplace needs, at both the employees' skills and the organizational levels, including, but not limited to those that the workplace education program might be expected to meet. The WNA is broader in scope than a literacy task analysis[4], though it might include such a process as part of the WNA. The WNA enables several functions to occur. It helps the EPT to make realistic judgments about what a literacy program can and cannot accomplish, to facilitate the integration of workplace and education goals, and to build rapport between the educational staff and the workers, supervisors, and managers. The WNA may also help the EPT to identify specific workplace problems that can serve as the focus of instruction in the problem-posing curriculum.

Instructional Program. Two key instructional features are singled out for special attention in the model: problem-posing curriculum and student portfolio assessment.

Problem-posing curriculum. In the CLCI model, curriculum development is driven by the identification of workplace problems for which workers generate solutions during the course of instruction. In that process they investigate the problem, identify potential solutions, test some of them, and communicate with management about the results. This process provides challenges to their reading, writing, computation, speaking, and listening skills. As inadequacies in these skill areas appear in the context of solving the problem, the learner is led to instruction in the areas of need. Consequently, this curriculum integrates the conventional basic skills with such other SCANS skills as observation, information processing, problem-solving, and teamwork.

The proposed solutions to the groups' problems are offered to management with the hope that some direct application to the workplace will be made, and that, in the best possible case, significant return on investment will result. Exactly what constitutes a "problem" for this model -- whether it is directly tied to the production process, to the big picture of how the business runs,

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[3]Sites were introduced to and guided in the specific process outlined by Sue Folinsbee and Paul Jurmo in "Collaborative Needs Assessment: A handbook for workplace development planners," Toronto, Ontario: ABC Canada, 1994. Both individuals provided formal training to all site staff early in the project and follow-up technical assistance as the sites carried out their WNAs.

or something else -- has been a source of lively discussion within the project.

Portfolio Assessment. Given the problem-focused nature of the curriculum, it seemed appropriate to use an assessment method that would allow for the fullest possible documentation of what workers accomplished in a class. Portfolio assessment is a technique in which actual demonstrations and samples of the learners' relevant work are collected in a "portfolio" and analyzed, usually jointly by the learner and instructor, for individual evaluation and planning purposes. As a result, this technique was promoted in the project. The tool is also especially appropriate for the whole-language approach set out in the proposal. Individual portfolios may include documentation of more traditional basic skills learning, but they may also contain documentation of problems, activities related to problems' investigation, solutions, management responses, and applications. The model has also expanded to include use of class portfolios as well as individual portfolios.

Evaluation. The CLCI incorporates two levels of evaluation. The first level is carried out by the EPTs based on program-generated goals. With instruction and technical assistance from the external evaluators, EPTs conduct internal evaluations according to a tool labeled the "Site Evaluation Portfolio," or more commonly "site portfolio." This site portfolio is another use of the portfolio assessment concept to help site staff keep track of their evaluation activities and results. The site portfolios are submitted by the sites to the external evaluators at periodic intervals.[5] The evaluators use the site portfolios to track the processes, outcomes, and context information from each site, as well as to pinpoint where the evaluators might provide assistance for the site to improve its evaluation. Formal feedback is provided to each site after submission and review of its portfolio.

The external evaluators also use the information contained in the site portfolios to supplement their own data collection for the second level of evaluation -- the more traditional, goal-based external evaluation. The information across sites is synthesized and used for both formative and summative evaluation purposes. Emphasis is on the use of evaluation results by the CPT to inform their deliberations about continuous improvements in the program, in line with the high-productivity context of CLCI.

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[4] A common technique for determining the literacy skills and content of either specific jobs or job types by analyzing the literacy characteristics of job functions; used for planning the literacy instruction.

[5] Originally three times per year, later negotiated with each site at points that made sense considering project activities.

Outcomes. The general outcome categories of interest to the CLCI are those concerning the worker, the workplace, and the business/union commitment to workplace education. Specific outcomes within any category are not specified at the statewide level; rather, suggestions are provided. For worker outcomes, the suggestions included SCANS skills and competencies, and other outcomes such as attitude improvement or enhancement of their interactions with their communities or families. For workplace outcomes, such options as scrap rates, cycle times, return on investment (ROI), or improved high-performance are among the suggestions. For commitment outcomes, institutionalization of some form of the program at the business is the criterion. Choices of specific outcomes within each category are up to the local EPTs as part of their goal-setting process. The external evaluators attempt to develop the best synthesis of outcomes across the statewide project, and these are presented under goal #3 in this report.

The Sites

The seven sites, which implemented the model for the past three years, are shown in Table 1. The table also includes some basic information to provide a sense of the scope of the project overall and by site. Notice that overall the project provided training to some 809 workers for a total of 22,003 hours over the three years. All of those hours were "on company time," for an estimated cost of $666,163 contributed by the companies. Total grant funds expended by the project were $902,715, of which $510,567 went directly to the sites for project implementation, and the remainder was for statewide project support. The site projects varied considerably in scope, as shown by comparing either the numbers of participants, numbers of training hours, company contribution or grant amount.

Table 2 shows the average costs per participant and participant hour. As seen in the table, the company contributions varied widely. These costs, and their wide variation, are functions of both the labor hourly rates per employee for their released time to participate in the training[6] and the numbers of hours of training offered at the sites. The median company contributions (row 1) were $330 per participant, at about $14 per hour. The cost per participant from the grant directly at each site (row 2) had a relatively narrow range, however, with a median of $581. The costs per participant hour from the grant, with a median value of $25, did vary widely, mostly as a function of the wide range of participant hours across sites, shown in Table 1.

[6] All employee participation in this project's training was 100% on company time.

Table 1. Site Descriptive Summary

Location	Business Partner	Description	Education Partner	# workers participated	# hours	Estimated company cost[7]	Grant Amount[8]
Rochester	Delphi Energy/UAW Local 1097	Fuel Injector Division of GM	Rochester City Schools	53	860		$271,135
Rochester	Eastman Kodak Corporation	Precision Components Manufacturing Division	Rochester City Schools	287	11,354		
Phelps	E.G.&G. Wright Components	Flow valves for aerospace industry	Wayne-Finger Lakes BOCES	95	1,021		$56,817
Homer	Albany International Corporation	Monofilaments for paper machine clothing	Onandaga-Cortland-Madison BOCES	40	490		$23,258
Elmira	Elmira Stamping and Manufacturing Corporation	Variety of metal stamping products	Schuyler-Chemung-Tioga BOCES	110	2,326		$57,681
East Green-bush	Albany International Corporation	Paper machine clothing	Hudson Valley Community College	150	4,236		$101,676
Menands	Albany International Corporation	Paper machine clothing	Hudson Valley Community College	74	1,716		
			Total =	809	22,003	$666,163	902,715[9]

[7] Individual companies' cost data are not shown here because of the proprietary nature of the data. The individual company values were used in the computations for Table 2.

[8] Grant amounts are only available for the education partner, not for each site.

[9] The total grant amount is greater than the sum of the partners' grant amounts listed above because the total includes costs for statewide administration, consultants, dissemination, and national meeting travel.

Table 2. Median and Range of Costs per Participant and Participant Hour

	Cost/participant	Cost/participant hour
1. Company contribution	$330 ($135-$1,533)	$20 ($10-$39)
2. Grant	$581 ($524-$798)	$25 ($17-$56)
3. Total site-specific (row 1 + row 2)	$911 ($659-$2,331)	$45 ($27-$95)
4. Total site-specific (row 3) + statewide support ($392,148)[10]	$1,939	$71

The grant costs (row 2) and the total costs (row 4) appear quite high, especially for the total with statewide support factored in. These high costs are a function of startup and development costs at both the local site and the statewide levels. These "additional" costs would not be repeated, at least not at that high a level, if the project were conducted again in any of these sites or in new sites that built upon what was learned in this project. The actual costs for a continuation of the CLCI would likely be between the values in rows 1 and 2 of the table, that is, between $330 and $581 per participant or between $20 and $25 per participant hour.

[10] The amount in the state grant not allocated to individual partners; see footnote #6.

II. Evaluation Activities

A number of important evaluation activities took place in the project. First, a good part of year 1 (November 1994 - October 1995) involved the evaluators becoming familiar with the program sites, personnel, and procedures. This was accomplished through the evaluators' active participation in statewide meetings, which provided site personnel some general orientation to the ways in which evaluation would be conducted in the project, and through visits to each site to assess evaluation capacities and needs. A formal and detailed Year 2 Evaluation Plan grew out of these first year activities and was presented in written and oral form to all participants in October 1995.

Second, in line with the Year 2 Plan, each site prepared and submitted installments of planned tri-annual site evaluation portfolios. These site portfolios were the main mechanism for integrating the internal and external evaluations, one of the operating principles of the original project proposal. The evaluators worked with each site to develop their internal site-specific evaluations, giving technical assistance as needed. The site portfolio information was then used as one key source of data to analyze across sites for the statewide external evaluation. The site portfolios were structured so that sites would document their key goals, indicators, evaluation plans, and progress to date in accomplishing the goals. These were scheduled for submission at the end of November 1995, March 1996, and July 1996. They were continued into Year 3 with submission and review dates determined to best match the schedule of activities for each site individually. The evaluators reviewed each site portfolio, provided written feedback on the contents, and recommended next steps for improving the evaluations and, in some cases, the presentation and organization of the portfolio materials. In all cases, the feedback was also discussed to the extent necessary with appropriate site personnel, either by telephone or on-site.

Third, during Year 2 the evaluators conducted two rounds of data collection site visits to all local projects, in January or February and again in June or July 1996. During Year 3, a single round of visits was conducted in June or July 1997. These site visits included individual or focus group interviews with coordinators, teachers, business or union representatives, and participating employees. Where appropriate, the site visits also included primary document review and class and workplace observations.

III. Results – Accomplishment of Goals

The CPT took great care and went through an extended process to articulate its goals. It did so after some initial orientation and planning experience at both the site and statewide levels and while some sites had begun initial training activities. Thus, the goals were developed to capture what all participants agreed were the key focal points and articulated both the breadth and depth of the project's scope. Therefore, the goals provide the best framework for analyzing and presenting CLCI results.

The CPT went a step beyond articulating project goals. With facilitation by the external evaluators, the CPT also articulated indicators for each goal -- that is, events and behaviors that could be taken as evidence that the goal was attained. These indicators were then built into the data collection protocols. The evaluators used the protocols in a manner that insured that all indicators were covered, typically with more than one data source. The indicators are presented below as an introduction to the results for each goal. The presentation integrates the information gathered from all sources into the picture of each goal's and related indicators' status.

GOAL 1. Provide a continuous improvement, customer-driven structure to support EPTs in attaining their goals.

Indicators:

1. A Central Planning Team is formed, incorporating representatives from all stakeholder groups, and meets regularly.
2. The CPT provides support to EPTs for their program development.
3. The CPT provides and receives communication from all project (central and local) participants in a systematic, accurate, and useful manner.
4. The CPT establishes its goals, reassesses their value as needed, and regularly evaluates its progress in achieving them; makes adjustments when progress is not satisfactory.
5. The CPT incorporates information from the external evaluation into its decision processes.

Key Findings:

A Central Planning Team representative of all local participating projects was formed in March 1995, about three months after the project's active startup in December 1994. The group met regularly, approximately bi-monthly, thereafter for about two years. The participating

representatives have been the local project coordinators and the four general project staff or consultants (statewide administrator, curriculum consultant, and two evaluators), with occasional participation of some business representatives and program teachers.

Local project representation at individual meetings was not complete during the first year, however. Meetings were held in Albany and Syracuse. When the meetings were held in Syracuse, the representatives from the two Albany area projects generally did not participate. Another site had difficulty with its business partner's participation in the program and participated in the CPT only once during that first year. This incomplete representation was taken up by the CPT during the spring of 1996, after this problem was noted in the Interim Evaluation Report of March, and increased efforts were made to encourage consistent participation. Those efforts appear to have been successful, for those site gaps were filled in with regular representation by all sites for the second half of the project.

Another gap in the desired participation was among the business partner representatives. Periodic special efforts had been made to encourage them to participate in CPT meetings during the first two years. They indicated, however, that they had difficulty justifying attendance at these full-day meetings under their work pressures. One exception took place during the July 1996 meeting when three representatives from one of the large companies came to the meeting. They indicated that they wanted further opportunities to interact with the statewide group after experiencing the value of such interaction during the May 1996 statewide workshop in Rochester.

Of the six projects active by January 1996, five indicated in interviews that they had received support from the CPT. The most valued type of CPT support mentioned was that deriving from participation in the group rather than specific technical program information. Specific values mentioned included:

- serves a good morale function; binds the people together
- provides some information, but the support is most important; facilitates getting to know the other project people and feeling comfortable calling on anyone
- gives a broader understanding of the total context of the project than can be obtained from the technical details alone
- provides the opportunity to be a participant able to learn from others, to experience being part of a governing team, to get a better sense of this "new view" of workplace education and of being on the right track in our program, to have reassurance that the individual sites are not alone in the things they struggle with, and to know there's a network and support group in which to participate.

All six local projects cited information they received about program help from the non-local project CPT members as very helpful. An item cited most commonly was the series of Tech Notes prepared by the curriculum consultant. These Tech Notes include:

1. *Collaborative learning for continuous improvement: an introduction*, 12/94.
2. *Building a team*, 12/94.
3. *Workplace needs assessment: what, why, who, how*, 12/94.
4. *Individual assessment: clarifying learner needs, abilities, interests, and progress*, 9/95.
5. *Planning a collaborative curriculum*, 12/94; revised as *Curriculum: creating multiple learning opportunities*, 7/95.
6. *Problem solving: a tool for workplace educators*, 8/95.
7. *Good thinking: how CLCI sites are interpreting curriculum and individual assessment*, 1/96.

The Tech Notes were designed to be brief and very practical, often using illustrations from projects within CLCI. For example, the material in #7 is derived almost entirely from the practices found among the CLCI sites, compiled in a way which allowed site personnel to know what others did and thus to receive tips to help refine their own approaches.

The CPT meeting facilitators made a written record of CPT proceedings prepared and distributed to site representatives for the first five meetings. That function did not occur for the next few meetings. Soon afterwards, the CPT decided to formalize the reporting and distribution function and make it the responsibility of the state coordinator with input from meeting participants. Records of the proceedings were sketchy from that point on. More consistent and thorough records of proceedings are normally an important feature to promote the sense of continuity and importance of their discussions and decisions in ongoing formal groups. Had the minutes been produced in fair depth and distributed in a timely manner, the momentum of the group may have been maintained better. Had they been produced and distributed within, say, a week or so after each meeting, then the information would have been available to assist the site representatives in presenting the meeting results to their local EPTs. This would have facilitated more effective communication to and from local site personnel about the CPT's thinking and decisions. Keeping the CPT's information systems flowing meant that someone had to take responsibility for those functions, and several members of the group did not view those functions as within their interest or priorities. The group may not have dealt with leadership structures adequately enough to maintain high levels of interest in making communications most effective for the fullest development of the group.

The extent to which this information from the CPT representatives was communicated to the rest of their EPT members or other stakeholders was systematically assessed at the end of the first year and informally afterwards. The first year's interviews and subsequent observations suggested that the local EPTs, or subgroups involved with ongoing tasks at the time, worked together closely and regularly enough that the most critical information did get transmitted in the context of current tasks and needs. Similarly, information flow from the local participants to the CPT was adequate; the representatives who did participate regularly in the CPT were those who understood the sites' activities best. They spoke for each site and for a fair representation of their stakeholders regarding the CPT tasks at hand.

As stated earlier, the CPT established its goals through a thoughtful and extensive process during the first year. The group evaluated its progress in achieving them through the external evaluators' Year 2 Interim Report in March 1996. That report was presented in written and oral form to the CPT in March and discussed by the group. One of the key statements in that report was that there was very little outcome data being collected at the site level. Partly in response to that finding, but also because it addressed other participants' expressed desires, the CPT planned and conducted the May 1996 statewide meeting to address the issue of developing worker outcome measures that could be assessed as part of the learner portfolios. Additionally, the external evaluators began promoting more focused attention among sites on gathering outcome data using the "Kirkpatrick model[11]" to report in their site evaluation portfolios. Progress was made in this area, with the results shown under goal 3 below.

The CPT had a systematic mechanism for regularly evaluating its progress in achieving the goals. The Year 2 Interim Report was a key agenda item at the March 1996 meeting, and the Year 2 Draft Final Report was an agenda item at the early October 1996 meeting. The discussion included understanding of the report content, feedback concerning its accuracy and usefulness, and implications for future CPT actions.

Attention to the goals and their achievement also took place in less systematic ways. Program implementation in line with the goals became more focused in the CLCI toward the end of Year 1 and through Year 2. Each site appeared to have developed a working understanding of some parameters that were not clearly defined in the beginning, such as the problem-posing curriculum, portfolio assessment, and how traditional basic skills fit in, and came to operate their programs in line with those common understandings. Thus, as issues arose about particular program features -- such as how to better implement student portfolio assessment or how to integrate the workplace education program with the company culture -- appropriate assistance was often sought and provided as needed, sometimes outside the formal CPT mechanism. These

[11] Donald Kirkpatrick, *Evaluating Training Programs: The Four Levels*. Alexandria, VA: American Society for Training and Development and Berrett-Kohler, 1994.

kinds of activities represent informal evaluation of progress toward goal achievement and responses to making "adjustments when progress is not satisfactory." All such activities known to the evaluators were in line with the program goals. Thus, they give further evidence of goal orientation by the central planners, though not necessarily identifiable in a systematic, linear fashion.

Finally, the CPT "slowed down" for the last few months of the project. Its last few meetings (with one exception, discussed below) were less clearly focused than the earlier ones. Fewer activities were planned, and each meeting had less closure and less continuity into the next. This may have been because the initial needs of sites in learning how to implement the CLCI had been met by that point, and because local site activities were winding down considerably at several sites. What remained in Year 3, however, was the need for work toward goal 4, Dissemination within the state. As the discussion under Goal 4 below will indicate, the deliberate, strategic efforts toward this goal were neither extensive nor effective, although the informal dissemination and continuation efforts were quite rich. More dissemination activity is planned for a grant extension.

Goal 2: Develop and evaluate/test the CLCI model of workplace education that integrates a workplace needs analysis, stakeholder planning and evaluation process, problem-posing curriculum, and portfolio assessment in ways that are appropriate for each site.

Goal 2A: Integrate the education program within the broader workplace culture by conducting and utilizing the results of a WNA.

Indicators:

1. The WNA attempts to identify broad-based workplace needs, including those that a basic skills program might effectively meet
2. All stakeholders are involved in developing the WNA goal.
3. Adequate data collection procedures are followed
4. Results are comprehensively analyzed and shared with all stakeholder groups
5. Results guide development of program goals and other aspects of the planning and evaluation framework

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Key findings:

Six of the seven local projects conducted extensive WNAs, which set the foundation for integrating the education program well into the broader workplace culture. In most of these six the EPT held lengthy discussions with a diversity of stakeholders -- including management, supervisors, employees and teachers. In those discussions they obtained substantive input from most, if not all, stakeholders, sometimes even at the design stage of the WNA process. Then they administered written surveys or conducted focus group discussions or individual interviews with representative samples of the workplace personnel. In the large companies, they studied large samples; in the small plants, they usually gathered information from all, or almost all, the employees.

One local site conducted a limited WNA. This site indicated that needs assessment information was collected regularly as part of ongoing processes at its plant, and that it was clear from recently assessed needs that an SPC math skills training program was needed for a new area of the plant. They completed that part of the training. At about the mid-point of the project they conducted a more extensive special assessment of team-building needs for all areas of the plant, the results of which were used to design and implement a new cycle of training.

As an example of a more extensive WNA for this project, the Site A[12] program coordinator met with the Human Resources Director and a small group of employee representatives to discuss the general orientation and possibilities of the program, worked out initial differences in orientations to workplace education, and planned an extensive and broad-based set of interviews with employees. She then conducted interviews with 84 people (the majority of the total employees at the plant), 27 salaried and 57 hourly, synthesized the results, and discussed them with the EPT over an extended period. Out of these discussions, the EPT generated program goals and a training structure. The results yielded significant results at two levels. First, they articulated a clear sense of the overall orientation to training in the plant:

> "A philosophy of building knowledge and process improvement is ingrained in the culture of this organization" [13] and among both salaried and hourly employees, "a strong desire to develop an understanding of the principles and knowledge that determine the processes and changes in their work, both at the level of their specific job titles and in the context of the company itself."

At the second level they articulated a more detailed, prioritized list of skills to address in the

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[12]Since confidentiality was promised to all participating companies, they are referred to as site A ... G. Each letter is used with consistency throughout the rest of the report, so that Site A always refers to the same company project, as does Site B, etc. Also, the site "codes" are not in the order of companies shown in Table 1.

[13]The company has already received the Excelsior Award, New York State's corporate excellence designation.

training: 1) communication, 2) math, 3) computer skills, and 4) job-specific skills in the context of the plant's total business framework.

Perhaps more important than the specific list of skills for which training is needed is a value of the WNA beyond those needs statements. The educators and the workforce establish a rapport, come to understand each other's perspectives better, and begin to develop trust in each other. The issue of trust is often a special problem, particularly among hourly manufacturing workers who sometimes view trainers and training purposes with some suspicion or skepticism. The latter was pointed out as a benefit in each of the small businesses that are part of the project, sometimes indicating a very significant turnaround in employee attitudes toward the educational partner. Additionally, the education partners reported a deepened understanding of the complexity of their roles beyond what they formerly saw as just teaching content and making sure it had some workplace examples. They became keenly aware of how prior employee training experiences affect trainee attitudes, motivations, and learning capabilities and how larger corporate or plant issues positively or negatively affect employees' abilities to translate what they learn into job practices. In addition, they became more aware, in these high-performance organizations, of the changing nature of the jobs in which workers need to apply what they learn from the classroom.

In the five programs that developed a distinct goal for this WNA, a small group developed the goal, which was then either refined or ratified by the EPT, and thus all stakeholders. Most often the WNA goal was developed at the statewide workshop in which the WNA process was presented. For one project, Site E, the entire process was taken back to the EPT and repeated in full there before the goal was developed.

Data collection procedures were adequate to the WNA goal in each case. Four of the six sites that did extensive WNAs used interviews, focus groups, written surveys with open-ended responses, or some combination of them. A fifth site analyzed actual workplace written materials. The sixth site used a written survey and the Test of Adult Basic Education (TABE). As stated earlier, samples were large or the full populations of employees were assessed. The data collected were analyzed in reasonably objective ways. Where written surveys or a test were used, the results were tabulated. For interviews, focus groups or open-ended survey items, results were studied by at least a few parties who identified trends and patterns in the responses and discussed them among key project staff to provide objectivity. In all cases, the draft results were reviewed by at least the EPT to involve all stakeholders at the review and discussion levels.

The results of WNAs did not always guide the development of program goals in linear fashion. Most often, the EPTs had a clear sense of the goals the program should pursue. The WNA was then used to verify the validity of or refine the statements of those goals. In addition,

the goals were often developed concurrently with the WNA data collection so that the emerging goals and the data informed each other during the development process.

The second indicator, and a step in the WNA process promoted by the consultants early on, specifies that a WNA goal should be agreed upon before the WNA is conducted. In practice in this project, however, it was sometimes difficult to pinpoint the exact point in the process when the WNA goal was developed as distinct from the other parts of the WNA process. Perhaps this step is too artificial for measurement, although it may be an important part of the WNA process that should continue to be emphasized in future program development. Similarly, data collection and analysis methods used by program personnel may have been less rigorous that the psychometric standards more often used by researchers. Nevertheless, the methods used among the CLCI sites were appropriate to the resources of the people conducting the WNAs, to the circumstances of the companies, and to attaining credibility among the stakeholders. These indicators may be more useful as a checklist for program development than as a set of evaluation criteria.

GOAL 2B: To guide project planning, implementation and evaluation at the local site level through a stakeholder-based team process

Indicators:

1. A site-level Education Planning Team (EPT) is formed, incorporating representatives from all stakeholder groups, and it meets regularly
2. The EPT continually assesses/identifies needs and interests of all stakeholder groups
3. The EPT establishes its goals and regularly evaluates it progress in achieving them according to the process outlined by the project evaluators, makes adjustments when progress is not satisfactory
4. The EPT documents and communicates its program goals, progress and needs to the CPT, and other appropriate audiences in a systematic, accurate, and useful way
5. The EPT develops and implements strategies for achieving its goals, including support to staff responsible for conducting activities

Key Findings:

Each site was required to form an EPT during the program start-up period in Year 1. All sites convened an EPT with representatives from all stakeholder groups, although some EPTs did not always have all stakeholders participate in all meetings. Stakeholders typically include a site coordinator and/or teachers, management (either upper-level or supervisors, or both), workers

enrolled in the program, and union representatives. A summary of activities and difficulties related to EPT meetings at each site is shown in Table 3.

Table 3. Status of EPT Meetings

Site	EPT Meeting/Communication Status	Problems that interfered with regular meetings
A	Met formally every month or six weeks until first course started. Site coordinator has much informal communication with business representative.	Partners chose to have informal but regular communications between the site coordinator and business representative as the most efficient way to continue program.
B	For the first year, until portfolio assessment began, team met every week. During Year 2, meetings were informal, without worker participation. Not active in Year 3.	Frequent shift changes made it difficult for workers to participate regularly. Also, when there was mandatory overtime the company relieved people of obligation to attend extra meetings.
C	For first six months, team met every four to six weeks. Met two or three times in Year 2. Reconvened at start of Year 3, but stopped after short time.	Supervisors did not attend EPT meetings; too busy. After long layoff in Year 2, Year 3's attempt failed to gain momentum.
D	Met bi-weekly for the first few months of '95, then subgroups met as needed for specific tasks and came together monthly. Did not meet from summer '95 to winter '95-'96; reconvened in Spring '96 to plan the next classes. Continued in subgroups only from then on.	Time available for floor workers to attend regular meetings, especially during heavy production. Management participation sporadic.
E	Met every two to four weeks as time and need dictated for first two years. Maintained intermittent contact during next six months of program "downtime." Reconvened for regular meetings for remainder of project.	Periods of corporate restructuring and tight production schedules make it difficult to meet regularly during occasional periods.
F	Established EPT at beginning of program, although site coordinator worked mostly one-on-one with company president and plant manager. More extensive meetings took place among key personnel from about 18th to 30th months, but never as formal EPT or with worker representatives.	Company culture has not been team oriented or participatory for workers. Management support for program intermittent.
G	Generally met every two weeks for first year. Reduced frequency once classes were well under way. Increased frequency around each new round of program activity.	Time was a problem for floor workers and management representatives.

In the first year most EPTs met regularly, usually monthly, and deliberately molded their programs' identities to meet the needs of their respective company cultures. Some sites' EPTs met as often as weekly during periods of intensive planning. However, by the second year, communication among team members often became more informal. Key EPT members, especially site coordinators and the business or union representative, would communicate as needed -- often quite frequently -- but not within the formal structure of the team. This happened, in part, because the felt need for regular formal meetings diminished once the

foundation of the program was established. After intensive collaborative planning, some teams decided, either explicitly or implicitly, that their program could be operated efficiently on a more informal basis. Decisions to work less formally were also the result of difficulties convening full teams with adequate supervisor and worker representation.

For example, at Site C the EPT did not meet formally from the time the first communications course ended in June 1995 until August 1996. At that time, the need for more systematic reflection on the Year 3 program by all stakeholders became clear and site staff did reconvene the EPT. Similarly, the EPT at Site D did not meet formally after the completion of the SPC program for more than half a year. In that interim, however, their program coordinator followed through with activities initiated by the EPT, continuing interaction with them as resources for the activities. Sites A and B also relied primarily on informal communications after the first year. The EPTs at Site E and G have continued to meet regularly, though not necessarily monthly.

One of the EPT's functions is to continually identify and assess the needs and interests of all stakeholder groups. Although some site coordinators may ensure that they get all stakeholders' opinions on a topic by meeting with stakeholders separately, if meetings are not held regularly, it seems unlikely that all stakeholder needs will be addressed continually. When meetings are held, continual assessment of stakeholder needs does occur, but this assessment appears to be more implicit than explicit. EPT meetings are forums where all stakeholder interests are addressed through content items on the agenda. All stakeholders are free in theory to comment on agenda items and to raise new ones. However, some stakeholders do not always attend meetings, such as supervisors at Site C or operators at Sites B, D and G. Additionally, when operators do attend, it may be difficult for them to participate fully, given their relative inexperience with planning meetings or other dynamics of power between them and management team members. In conclusion, the needs and interests of all stakeholder groups were assessed with sufficient continuity that programs met genuine needs. However, workers' needs and interests are still likely underaddressed.

Under the leadership of project coordinators, the EPT develops and implements strategies for achieving its goals, including support to staff responsible for conducting activities. All sites, except Site F, developed goals and identified strategies for achieving those goals.

A somewhat problematic situation for most EPTs has been maintaining continuous involvement of employee representatives. Scheduling difficulties, shift changes, needs "on the floor" at more pressured production times, and sometimes less than full employee interest or management support for employee involvement in these meetings have all created difficulties. This difficulty existed somewhat in four of the seven sites.

All sites established goals and evaluated their progress toward those goals approximately according to the process outlined by the project evaluators. Three sites explicitly and formally evaluated themselves according to their goal accomplishment, either in their EPTs, in their Site Portfolios, or both. Other sites did so in a most informal way, generally gauging whether or not there were major problems and adjusting activities to solve those problems. Some sites, however, did not make adjustments to address their fairly clear lack of goal accomplishment. The evaluation process that the evaluators outlined for the sites in the site portfolio suggested that the EPT make adjustments to the program plan based on what is learned through evaluation activities. While this is logical, it does not describe the way the process actually worked at the site level. Formal data and analysis did not inform program planning with any regularity, perhaps because most sites were just beginning to formally collect and analyze data near the end of the project. However, program decisions were made in a less formal way based on observations of what was working and not. For example, Site G decided to offer more basic skills classes after observing that workers in the problem solving classes needed to work on basic skills. In a case like this, there was no need to formalize an evaluation of the adequacy of workers' basic skills because it is being done well enough on an informal basis. If an EPT is strong and both formal and informal means of communication are in place, then communication of "findings" and analysis takes place naturally.

Given the scope of the CLCI, however, the use of informal evaluation does not reduce the need for more formal evaluation results. Furthermore, it is easier to get Kirkpatrick[14] Level 1 (participants' reactions) and 2 (learning from the instruction) data more informally. Workers and teachers may easily observe what workers liked about class and what they learned. Data for levels 3, 4, and 5 (application of new skills to the workplace, effects on the workplace of such application, and return on investment, respectively) are not so easily observed and require formal data collection and analysis.

The site evaluation portfolio became the chief means of communicating sites' goals, progress, and needs most systematically to the CPT. The site portfolio is a unique feature of the CLCI. Its purpose and method was discussed one of the model's elements in the first section of this report. A set of selected site portfolio worksheets provided to the site coordinators by the evaluators is shown in the Appendix. Although there is an evaluation process outlined in the Site Portfolio Guide, the process was adapted in different ways by the seven sites.

[14] Kirkpatrick, *op.cit.*

Goal 2C: To develop a curriculum & instructional model which incorporates a problem-posing framework and portfolio assessment.

Indicators:

1. Curriculum units have a stated workplace problem that forms the core of the unit.
2. Student participants were actively engaged in identifying the problems for the curriculum units
3. The problems identified for the curriculum and instruction are brought to identifiable closure. Either A) there is a stated resolution, or B) there is an explicit decision to not take any action related to the problem.
4. Problems and their resolutions from curriculum & instruction are communicated to management, and responses are received and processed
5. Some of the problems from curriculum & instruction directly or indirectly influence changes in the workplace (either worker, environment, or policy changes)

Key Findings:

The results on these indicators across all sites are summarized in Table 4 and are discussed below in an integrated manner rather than by separate indicator.

Among the seven projects, six conducted classes in which the employee participants identified a problem on which to work.[15] These problems specified a workplace situation that could be considered to have a reasonably manageable solution in an identifiable time frame. Some examples include:

> Site E -- "hot job" buildups, how to eliminate or reduce them; subproblems: a) mapping the total work flow process; b) developing a Process Improvement Form; and c) developing recommendations for worker cross-training
>
> Site C -- inadequate understanding of and participation in company retirement programs
>
> Site G -- shift change communications inadequacies; inadequacies in cross-training; product waste resulting from improper conveyance equipment and its alignment with production machinery
>
> Site B -- improve workers' abilities to record and accurately log paperwork and paperflow processes, a problem that requires direct improvement in written communications skills in a specific workplace context.

[15] In Site D, two groups worked on production-related problems, but the managers, not the participants, identified these problems.

Table 4 Summary of Sites' Results for Problem-Posing Curriculum Indicators

Indicator	Site A	Site B	Site C	Site D	Site E	Site F	Site G
1. stated problem	A. poor comm'n between workers and supervisors B. upgrade math skills for SPC & other functions	difficulties recording and accurately logging work processes	A. how to communicate to workers the types of benefits packages available to them to ensure they make sound choices among them B. how to increase the complexity and diversity of design work allocated to the 3rd shift C. upgrade math skills for SPC & other functions	A. SPC for Sequential Central Port Injection B. decrease rejects/ eliminate need for end-point inspection in one unit C. eliminate leakage in test meter D. SPC for Linear EGR	A. need for tracking system to deal with bottlenecks B. better communicate to other shifts and departments problems detected during production C. insufficiently trained personnel in one department D. insufficient coordination & communication across departments E. Computer skills F. Math for Geometric Dimensioning & Tolerancing	A. not enough lead time to do job well B. standard metal stools uncomfortable, reduce productivity, increase back problems C-F. (4 other similar groups each identified problems) G. Team-building and group facilitation H. Shop math	A. reduce waste due to product falling from process line in one department B. reduce waste due to excess camber in another department C-N. (12 other similar groups each identified problems) O-X. 11 classes in customized Essential Skills involving reading, writing (e.g., writing for performance reviews), math, & learning strategies
2. students identify	A. & B. indirectly (part of general WNA)	No	A. & B. Yes C. No	A. & D. No B. & C. Yes, after supervisors set general problem area	A - D. Yes E. & F. Indirectly (part of WNA)	A. - F. Yes G. & H. Indirectly (part of WNA)	A - N. Yes O.-X. Indirectly (part of WNA); some input from students in A-N classes

Table 4 Continued

Indicator	Site A	Site B	Site C	Site D	Site E	Site F	Site G
3. closure	A. developed case examples of specific comm'n problems & possible solutions B. Curriculum covered	Clarified forms, improved their use; developed new forms to improve work process	A. Yes (set up seminars for workers) B. Yes (got designer, engineer and HR director to help with 3rd shift redesign) C. Curriculum covered	A. Not applicable B. & C. Yes.	A. Yes (set up White Board system for tracking) B. Yes [PIF (Process Improvement Forms) system] C. Yes (cross-training system for new operators) D. Yes (map assembly process, rate levels of assistance needed for each step, recommend cross-training system)	A-F. Mixed, some Yes, some No G. & H. Not applicable	A. Yes (developed, pilot-tested, and implemented waste-tracking system) B. Yes (series of 5 operational improvements) C. Yes (plan for system) D-N. Yes O.-X. Curriculum completed
4. communi-cated to management	A. Yes B. Not applicable	Built into "solution"	A. Yes B. Yes C. Not applicable	A. & D. Not applicable B & C. Yes	A.-D. Yes E. & F. Not applicable	A-F. Indirectly G.& H. Not applicable	A.-N. Yes O.-X. Not applicable

Table 4 Continued

Indicator	Site A	Site B	Site C	Site D	Site E	Site F	Site G
5. influence workplace changes	A. Uncertain; issues being addressed informally B. Not tracked yet	Yes, processes changed	A. Yes, seminars conducted; workers made changes in benefits selections B. Yes, 3rd shift dealing with more complex designs C. Yes, using calculators at work stations	A. Yes (461% decrease in rejects compared to other group; 514% scrap cost savings compared to prior rates) B & C. No, management would not accept worker-recommended changes D. Yes; corrected problems with old SPC system	A. Yes, fully implemented in all departments, and expanded beyond original team proposal B. Yes, used by operators for 2 parts C. Not yet, space/time problems, put on hold D. Not yet, put on hold, since limited time/resources and priority given to A & B E. Yes; operators use computers on machines and reduce tasks of middle management, improve accuracy and cycle time F. Not tracked yet	A.-F. Not directly; may have laid groundwork for employee involvement G. Improved communication within plant H. Not tracked yet	A. Yes, management agreed to take system to all departments within the unit B. Yes, implementing changes; report better labor distribution and smoother scheduling flow C. Yes, managers gave TA time and supervision to implement the cross-training system; integrated this system into corporate plan for employee personal training system D-N. various degrees of influence O.-X. Not tracked yet

In two sites the problem statements appear more akin to topics than problems. These include Site D's "SPC for the Sequential Central Port Injection" and Site A's "poor communications between workers and supervisors." The former applied formal problem-solving steps and workplace situations to its treatment in the course. The latter, while broad on the surface, was reinforced often during the classes as being a clear problem, quite pervasive in the plant, and had very clear embodiments that were used as learning activities in the classes. The classes generated case studies in communications problems and their solutions. Thus, although the core of the curriculum in these kinds of projects was broader than the others above, they were made specific for the workplace in the individual classes.

There is a third category of classes or instructional content that emerged during Year 2; these were "customized workplace basic skills." These types of classes included: math and reading skills at Site G, math skills at Site C, and computer skills at Site E. These classes were developed out of the formal or informal WNAs at their respective sites, and were highly customized to the specific needs at the companies in which they were offered. They did not, however, have at their core a "workplace problematic situation" similar to those in the first, or even second, category above. Most of the findings in this section refer to instruction in the first two categories above, since those are the types referred to by this goal's indicators.

In five of the seven sites the workers, as participants in classes, identified the problem in at least some of the classes offered at the site. Furthermore, all such classes, except those at Site F, brought closure to the problem, either by developing a specific system or plan to ameliorate the situation or by recommending to management that a system be implemented according to the general parameters the group outlined. These "solutions" were communicated to management in each case, usually by a class presentation to a regular management team, and, in all such cases, some form of feedback on the solution was provided by management. In some sites, or for some classes in some sites, management representatives were involved at least indirectly in the classes. Thus, communications between participating employees and management were ongoing and interactive as the problems were identified and refined, and solutions were developed. In the Site F case, the classes were not taught until near the end of year 2 because of ongoing wavering commitment to the program by management. During the problem-solving classes that commitment was again called into question and it was made clear during the course period that solutions from the classes would not be implemented. Consequently, the classes did not bring their problems to closure with solutions.

Finally, changes were made in the workplace in almost all cases for the projects that conducted classes using the problem-posing model and that had the learning teams define the problem for the core of the unit. In some cases the changes made were modified forms of the teams' recommended solutions. Modifications occurred as management incorporated the

solutions into other initiatives at the plant. In a few cases the changes recommended were not made because multiple teams developed solutions to different problems and changes had to be prioritized to fit resources available. Those solutions were put on hold until the timing was more appropriate or resources would be available.

There were curriculum units that did not fit into the ideal model described by the majority of sites' experiences above. These are considered variations of the problem-posing model to fit appropriate company circumstances. For example, Site D did not use a specific problematic situation in the workplace as its curriculum core. It developed its topic for training (SPC with problem-solving applications) out of a company/union statement of what was needed for a specific work unit at the time. The site D project, in addition to obtaining improved employee basic skills, also obtained substantial changes in the workplace by yielding over 400 percent decrease in reject rates and over 500 percent increase in scrap cost savings compared to its control measures[16]. Site A did not appear to use the problem-posing model in as direct a way as the others. It did, however, as a result of its WNA, identify one of the broadest workplace problems among all sites: inadequate communications between workers and supervisors. It used more specific parts of that problem area as the impetus for its classes in basic communications skills. Its influence on the workplace has not yet been assessed. Both of these examples indicate ways in which the problem-posing model can be adapted to take account of the total corporate cultures of companies and serve the needs therein.

There were other striking features about the problem-posing model that received comment from project participants. First, some workers, supervisors, and HR personnel expressed impatience with workers, either as part of the classes or in the WNA, being asked what the problems were or what they wanted to work on in class. They either wanted to be told what to work on, to identify the problem more quickly, or to work to a solution more quickly. It can be argued that if teachers or program coordinators accede to these requests, they might short-circuit the problem-solving process, reduce participant ownership of the problem and thus minimize the learning involved in trying to solve the problems. On the other hand, these are some of the adaptations that may need to be made with the model to integrate it with particular workplace cultures.

Second, some projects, after having done what might be considered ideal problem-posing curricula, have begun to question whether this model adequately addresses the conventional basic skills (the 3 Rs) in which the participants need help. Some responded by providing more conventional basic skills' instruction for those participants who saw the need for such help themselves. It may be that this is one value of the problem-posing curriculum -- it provides a

[16]More detail on these figures is provided under Goal 3, Indicator 5 below.

powerful foundation to identify the "basic skills" needs, instigates worker self-interest and motivation to fill those needs through further education, and solidifies a workplace context for which skills to teach and how they will fit into worker and workplace improvement.

Goal 2C, **Indicator** 6. Student participants each have a portfolio with the following characteristics

- states student learning goals
- demonstrates personal performance of students, including evidence of progress and action plans for solving particular problems
- is collaborative effort between teacher and student
- is learner-centered in contents and processes

Goal 2C, **Indicator** 7. Facilitators/teachers use evidence from learner portfolios to plan future learning activities

Key Findings:

Two important features characterized the implementation of student portfolio assessment activities. One, they were used at the full individual student level in only two sites, B and G. Two, they were used in partial form at the class level in four sites. A summary of the major features of portfolio assessment that have been used by sites is provided in Table 5. Five of the seven sites report having some type of individual student portfolios for at least some, though never all, of their classes. Only one, Site G, however, contained all the characteristics listed in Indicator 6 above.

At least two factors seem to have come into play to make it difficult for sites to use portfolio assessment as intended. First, because of CLCI's emphasis on the problem-posing curriculum, most of the classes have focused on the problem-solving process in a team setting. This emphasis makes the identification and assessment of individuals' skills and knowledge of the course content difficult, because individuals make very different kinds of contributions to the team process in identifying and solving group problems. In addition, the tasks individuals will perform during the course cannot often be pre-specified, for, within the general parameters of the problem-solving process, the next activity depends on the prior ones. Second, the courses have been relatively short-term (maximum of 10 weeks at 3 hours/week). Teacher preparation and

Table 5. Key Features of Student Portfolios by Site

Portfolio Feature	Site A	Site B	Site C	Site D/ SPC	Site E / Problem-Solving	Site F	Site G
Individual Student							
Elements	Not used	pre & post measures for each worker on each document in paperwork/ flow process	participants save selected elements of work in their folders	collection of student work	any investigation or gathering of information	not used	<u>for reading & math classes</u> - rubrics - artifacts
Uses		assess learning needs, and learning gains	students assess own progress; use as basis for developing resumes and for internal promotions	reviewed by teacher to see who needed help in what areas			- students do self-assessment - teachers assess - guide for what artifacts to include - mid-course and end-of-course assessment - include into Employee Development Plan if employee volunteers it
Class							
Elements	case studies in communications problems & solutions generated			objectives with extensive rubrics for each, assessed by teacher			<u>for problem-solving classes</u> - group artifacts to demonstrate what's done in class
Uses	plan to present to management			post-assessment only	reviewed by teacher to get sense of group's needs & guidance for next steps		presentation to management

facilitation of the group are so time-consuming that little time is left for individual portfolio planning, assessments, and feedback into individual instructional plans, especially since individuals skill development is not the primary focus in most courses. For the classes which taught customized workplace basic skills (e.g., Site G's workplace reading and math), individual portfolio assessment was used more fully.

Three sites have adapted the portfolio assessment concept to group portfolios for their classes. In these cases, the portfolios were used as more of a repository of information and documentation about the group and its products rather than providing guidance in the learning process throughout the class. One site, Site E, did make some informal use of the individual portfolios to generate periodic assessments of the class, which then gave a sense of how to better direct subsequent class activities.

Goal 3. Demonstrate results of the CLCI model on:

A. workers (SCANS competencies and other benefits, e.g., improved self-confidence)

B. the workplace (including ROI and other impacts, e.g., improved high-performance characteristics), and

C. business/union commitment to worker education.

Indicators:

1. Each site's portfolio shows evidence of substantial attainment of at least one SCANS competency, defined as appropriate for each site.
2. Each site's portfolio shows that it has considered how ROI might be measured for that site, evidence of ROI, as selected or chosen by the site, for its business/union partner.
3. Evidence of other worker and workplace impacts is seen in site evaluation portfolios.
4. Evidence of business/union commitment to worker education is seen in the site portfolios
5. From the data collected and analyzed by the external evaluators there is:
   A. Substantial attainment of at least one SCANS competency
   B. ROI is evident in each participating company
   C. Evidence of business/union commitment to worker education
   D. Evidence of other worker and workplace impacts

Key Findings:

For indicators 1 – 4 , four of the seven sites provided systematic information in their site evaluation portfolios, following the details that these indicators specify. This appears to have been the first time the site evaluation portfolio was tried in workplace education projects, and the

specification of what could realistically be entered into the portfolios evolved during the project. Only one site followed the process from the outset as outlined by the evaluators. Three others developed their site portfolios to include most of the desired information and format to a point that was organized sufficiently to meet the purposes during the third year of the project.

Some outcome information in the areas of SCANS competencies, other worker and workplace impacts, and possibly business/union commitment to worker education is found in those four sites' portfolios. Much of the extant outcome data also comes from the collection of information by the external evaluators from the site visits and through telephone discussions and written correspondence. The results are presented and discussed below.

Indicators 5 A and D overlap considerably and thus the findings concerning them will be discussed together. Basically, the projects have accomplished substantial amounts in these areas. The evidence is mostly anecdotal, though some comes from careful assessments of participant learning in classes and from documented workplace impacts. Results are summarized in Table 6. The worker outcomes are most often in two areas: communications skills (listening, speaking and writing) and problem-solving skills. Additional areas mentioned are teamwork and group skills, and attitudes or self-confidence. Some of the workplace outcomes further reinforce the communications and problem-solving skills of individual workers in designating the specific uses of those communications and problem-solving skills.

Other workplace outcomes are less directly tied to the content of the courses, but involve examination of "hard" outcomes related to production. For instance, at Site D, one team was trained through this grant in SPC and applied problem-solving for a new production line. For the first six months after the training, which was concurrent with the start-up of the new line, they tracked their scrap rates and those of a comparison group on a similar line who received only OJT. The production line involved in the grant's training program had 461 percent fewer rejects than did the comparison group over that period. Additionally, the company budgeted a certain number of dollars for scrap, based on historic data for this type of product. That budgeted amount was 514 percent more than the grant-trained team's actual scrap cost.[17]

For the other case, Site E, the results are summarized in Tables 7 and 8 and are shown in graphic form in Figures 2 and 3. The data in Table 7 and Figure 2 indicate cycle time, showing deviations from the average over the 16-month period.[18] The figures indicate a marked trend of decreased thru-put (or cycle time) in workdays over the period, with the greatest decrease occurring after the April period when the company initially implemented the PIFs and white

[17] Two other sources of influence may have affected this outcome. One is the Hawthorne Effect (the positive influence because this was a special set of circumstances). The other is the possibility that the workers on the new line may have had significantly different work-related abilities, though these were not assessed – workers on the new line bid for the job through their union protocol, generally with seniority as the sole criterion.

[18] These were transformed from the original figures to mask the company's original proprietary data.

Table 6. Summary of Sites' Results on Worker and Workplace Impacts

Outcome Area	Site A	Site B	Site C	Site D	Site E	Site F	Site G
SCANS & Other Worker Outcomes	Communications: (anecdotal, from workers) better: - listening - understanding others' points of view - better use of communication strategies (e.g., active listening, clarification) Math: - Understanding of finance, value, future value, stat'l analysis for Quality Assurance	(anecdotal, result of WNA process): attitude toward training much more positive (thru 3/96) - (anecdotal, supervisors report): document work processes accurately	(anecdotal): - understanding of problem-solving process - increased self-confidence - more proactive in work teams & with company - increased appreciation of company - better understanding of system change processes - changes in 401K investments - plot charts - geometric calculations - profit & interest rates - basic trig	SPC (teacher assessment on rubrics for objectives): rating of 3 to 4 (highest) on 4-pt. scale for 82/83 SPC and problem-solving objectives across 3 classes (anecdotal): - understand SPC charts on job - use charts to solve problems - can now talk to engineers (reported by engineers) - better morale reported and observed - take more initiative - communications indicate active concern for quality Problem-solving (anecdotal): - more systematic & comprehensive p-s skills - structure group work - confidence in communication with managers -work better in small groups	Problem-solving (follow-up survey) improved: - listening skills - communications in team - speaking - accessing & presenting information - confidence in speaking and interacting with leadership - Better organized Computer skills (anecdotal): - basic use & applications - more empowered on job	(pre-post tests): -communications -problem-solving skills (written survey): - listening - how to state problems	(anecdotal) improved: - problem-solving skills; how to get ideas out, evaluate, analyze, and prioritize them - formal teamwork & group process skills - workers have more accurate assessment of their reading and math abilities & needs - leadership, initiative & follow-thru on floor & with management - pay attention to on-line quality - specific computer software now used - how to talk to managers - how engineering relates to operators - speaking: formal meeting presentations to management - feel more empowered in organization

Outcome Area	Site A	Site B	Site C	Site D	Site E	Site F	Site G
Workplace	Math: - use of calculators on floor, improved accuracy - conversions to metric	- improvements in several forms used to document work processes - refined & improved existing forms	- many more employees attended benefits seminar than before, made more benefits changes - designers & engineers now spend time in 3rd shift pin-seaming - increased leadership by some - use of calculators at work stations, improved accuracy	SPC: - 461% improvement on defect rate - 514% dollars saved on scrap costs Problem-solving : - increased communication & teamwork	- managers report in writing that overall workflow processes improved with product (PIF) from one team - significantly reduced cycle time - significantly increased early or on-time shipments - increased e-mail, thus communications - operators order own parts, download & adjust specs directly	- taking initiative - active in solving problems - more trusting environment - management listen to floor workers more	(anecdotal): - use white boards to communicate now - use e-mail system - attention to quality improved, e.g., molds now kept cleaner - workers stay over shifts to help next shift - better & more constructive communications with management (cost projections): - one team's problem solution to purchase, install, and use a new conveyor system in one business unit projected to save $114,000/year after $57,000 initial investment, which was made - another team's solution to improve tracking system included regular monitoring of temperature and humidity in the storage/holding area; tracking through the first 3 months after implementation resulting in an estimated savings of $120,000/year compared to data available for year before new system

Table 7. Site E, Thru-Put in Workdays, Deviations from Average

Plant Unit	Jan 96	Feb 96	Mar 96	**Apr 96**	May 96	Jun 96	July 96	Aug 96	Sep 96	Oct 96	Nov 96	Dec 96	**Jan 97**	Feb 97	Mar 97	Apr 97
M	6.63	1.63	7.63	**3.63**	-1.38	-3.38	-7.38	-7.38	-8.38	-11.38	-12.38	-9.38	**-9.38**	-13.38	-13.38	-10.38
C	7.38	2.38	8.38	**1.38**	-3.63	-5.63	-5.63	-4.63	-6.63	-4.63	-5.63	-3.63	**-5.63**	-4.63	-4.63	-6.63
A/T	5.25	6.25	-3.75	**14.25**	-4.75	-8.75	-1.75	-6.75	-2.75	-5.75	1.25	0.25	**-1.75**	-4.75	-5.75	-3.75
Total	19.25	10.25	12.25	**19.25**	-9.75	-17.75	-14.75	-18.75	-17.75	-21.75	-16.75	-12.75	**-16.75**	-22.75	-23.75	-20.75

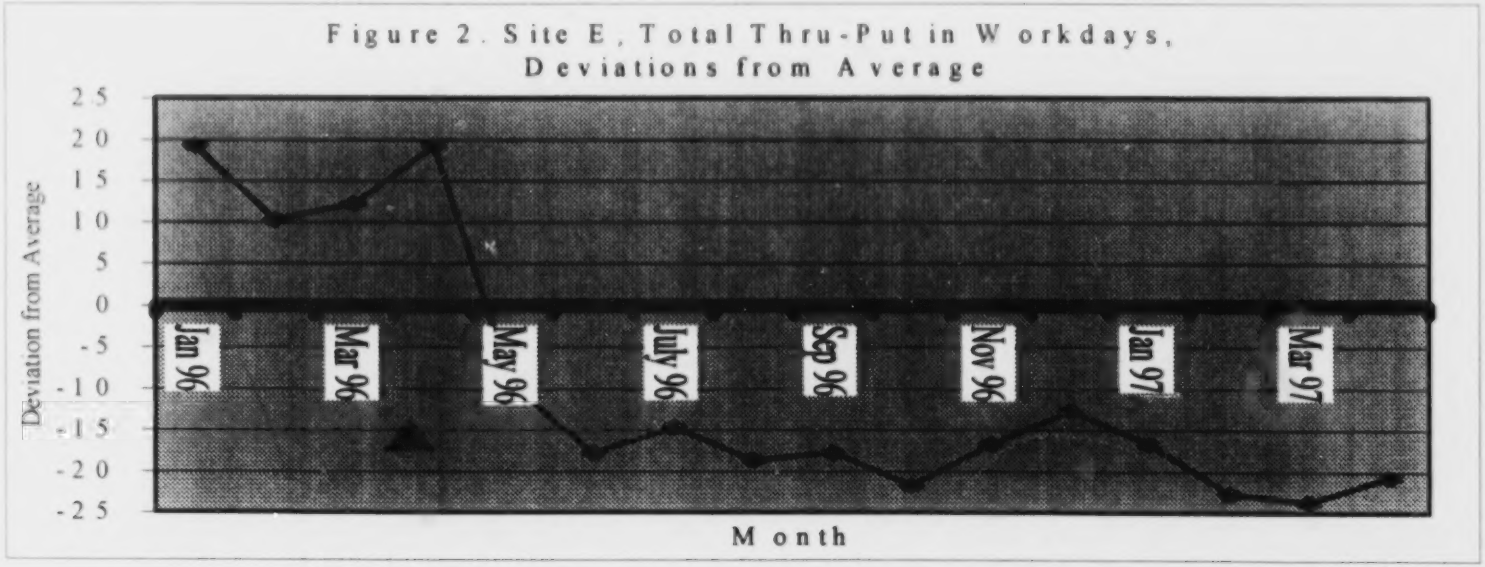

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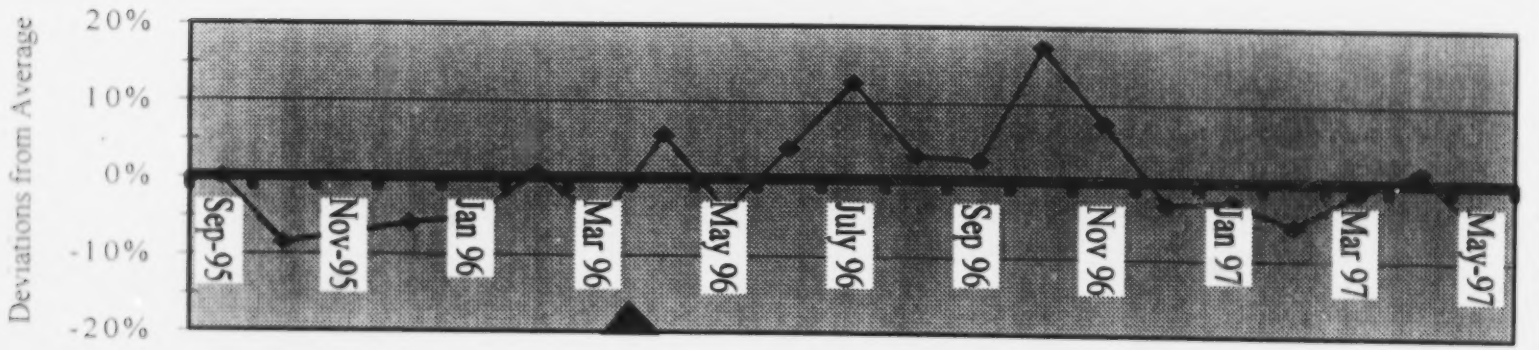
Table 8. Site E, Percent of Customer Shipments Early or On-Time
Deviations from Average

Sep-95	Oct-95	Nov-95	Dec-95	Jan 96	Feb 96	Mar 96	**Apr 96**	May 96	June 96	July 96	Aug 96	Sep 96	Oct 96	Nov 96	Dec 96	**Jan 97**	Feb-97	Mar 97	Apr 97	May-97
0%	-9%	-7%	-6%	-5%	+1%	-6%	**+6%**	-4%	+4%	+13%	+3%	+3%	+17%	+8%	-3%	**-3%**	-6%	-1%	+1%	-6%

Figure 3. Site E, Percent of Customer Shipments Early or On-Time,
Deviations from Average



boards, "solutions" from the problem-solving classes. Notice that the total figures across all three plant units (M, C, and A/T) were above average (positive deviations) for the three months before April and were far below average (negative deviations) for the 12 months after April. The same trend is apparent within each plant unit, although generally less pronounced.

Examination of the customer shipments that were early or on time before and after April, shown in Table 8 and Figure 3, reveals the same trend. For five of the seven months before April, the early/on-time shipments were below the average for the period, while they were above the average for seven of the eight months after April (through November 1996). They then decreased to slightly below average again for the six months afterwards, reflecting a period of dramatic increase in customer orders as well as corporate and plant reorganization during the period (described more fully in Volume IV).

The trend to this point, however, strongly suggests that the intervention of the PIFs and the white board system that grew out of the federal grant's problem-solving/ communications classes had a positive impact on the plant's production at this company. When we consider the other major events that might have affected these results, they seemed to have little, if any, impact. One other major event was the purchase of capital equipment (3 of 10 major machines were obtained from April through June 1995). Another event was that some machinists receiving training in basic machine tool skills at the local BOCES over the course of that year. The machine tool training, however, was taken by 7 of 19 machinists and is not an unusual event; it is taken as needed by skilled people in the plant on a fairly regular basis.

Outcomes related to ROI and business/union commitment to workplace education are summarized in Table 9. Although ROI assessment was one of the underlying principles of the grant proposal and initial interests, questions about its value emerged during the first year. Since assessing ROI would have required the companies to supply information that is sometimes not readily available and is proprietary, the evaluators needed the companies' high level of interest to follow through with the ROI assessment. As a result, the evaluators conducted interviews with each participating company's business or union representative near the beginning of Year 2 to inquire about the extent of their interest. As shown in the table, three of the companies indicated that they were not interested in ROI, that they valued education in itself for their workers and didn't need the justification of a formal cost payback analysis. Their experience had taught them that new or improved skills and a positive attitude toward learning would manifest themselves in good results on the job. The other companies were interested, generally to help bolster the priority of company investment in workplace education in the rapid decisions that are sometimes made while restructuring and downsizing. That is, they don't expect that decisions about corporate investment in employee education are made on cost considerations alone, but that those considerations can be part of the decisions and commitment.

Table 9. Summary of Sites' Results on ROI and Commitment Impacts

Outcome Area	Site A	Site B	Site C	Site D	Site E	Site F	Site G
ROI	not of interest to company	not of interest to company	not of interest to company	of interest; have return (R) info, need investment (I) info	of interest; have return (R) info, need investment (I) info	not applicable	of interest; have return (R) info, need investment (I) info
Business/Union Commitment to Workplace Education	have changed view from education as "1-shot" training to participatory system and have committed management and operators' time to it	was very high before grant; continues to be very high	employees' use of tuition reimbursement went up from 2% requests to 15% requests after 1st cycle courses; leveled off at 7% ; company was pleased with this increase & maintained the reimbursements, though it cost them more money	was very high before grant, continues to be very high	member of Corporate Group responsible for continuous improvement indicated that the training teams' "solutions" were "exactly what was needed to foster continuous improvement at" the company	appears low	- CLCI process helped shape company's strategies for WE; education unit "bought it" for company - increased WE central staff from 2 to 6

Business or union commitment to workplace education is perhaps the most difficult of all the indicators to assess with any precision because its criteria were not detailed. The information that does exist on this indicator comes from the evaluators' site visit interviews with the site coordinators and business/union representatives which asked them to describe that commitment.

Three sites, A, B and D, responded in general terms that the commitment was very high before the grant and remains so. Thus, the grant had no measurable impact on the level of company commitment, because there was no room for increasing the level according to those reports. Two other sites, E and F, gave more specific responses indicating changes in the companies' views of workplace education and that they had taken steps toward institutionalizing the participatory manner of planning and conducting workplace education programs. Site E also found the participatory aspect to fit into their general corporate direction, plant efforts, and continuous improvement activities. They considered the project a success and therefore will continue to use an EPT, or a variant of it, to guide their education and training programs. A sixth, Site C, responded with a positive view of the program, noting that it significantly affected workers' enrollment in formal courses outside the company for which they requested and received tuition reimbursements, an increased cost the company was pleased to incur. The ways in which that commitment would continue to be demonstrated became unclear, however, when the Personnel Manager left for another job. This suggests that the commitment was not rooted high enough in the corporate structure to support regular ongoing programs without greater initiative and activity provided by the education partner. The seventh site showed sporadic educational efforts throughout the grant, though their increased consistency toward the end of the program gives some evidence that they may have increased their priority on worker education, perhaps partially due to the influence of this project.

Goal # 4: Promote continuation of the project at existing sites and expand to new sites in NY State.

Indicators:

1. Conduct workshops in partnership with the ten affiliates of the NY State Consortium for Staff Development
2. Provide technical assistance to partnerships of workers, educators, and businesses seeking to establish a workplace literacy program in support of a continuous improvement initiative
3. Establish, test, and maintain a tracking system to measure the extent to which the project is replicated

Key Findings:

The CPT addressed this goal somewhat during Year 3. Most of the activity in this area consisted of nine presentations by CPT members about selected aspects of the CLCI project to local or regional groups of adult, vocational or workplace educators around New York State. For example, the state coordinator made a presentation on "Workplace Literacy: Business and Industry Process" to the Rockland BOCES and NYSED ACCESS Job Development Technical Assistance Conference in June 1995. In May 1997 the state coordinator, one site coordinator and one program teacher led a discussion of "Workplace Needs Assessment: First Step in Planning a Collaborative Workplace Education Initiative" with the OCM BOCES Workforce Consortium Advisory Board Meeting. Although technically not within the New York State parameters of this goal, several project staff members made presentations on the project or aspects of it at professional meetings outside the state. These included a statewide conference in New Jersey, the National Workplace Literacy Program Conference, six presentations at the two annual North American Workplace Learning Conferences, and a national Adult Basic Education conference. Additionally, features of the project were described to international audiences on Internet listserves and other such electronic communications venues, and project materials were distributed to interested parties across the United States and Canada as those parties heard about the project through the Internet or conference sources.

That level of dissemination activity is quite extensive. In addition, the evaluation reports (particularly Volumes II and IV) and several written products by the project's curriculum consultant are intended to aid the technical assistance and continuation efforts after the project

ends. Moreover, the project has obtained a 6-month no-cost extension (for November 1997 – April 1998) to formally conduct dissemination and other continuation support activities.

Additionally, some site coordinators have more informally acted to disseminate the model. One coordinator from a BOCES and another from the Community College report using the model or appropriate components of it, with other business partners as they start up their new workplace education programs. Another coordinator has conducted workshops on the model for the Finger Lakes Consortium for Professional Development, further moving knowledge of the model into the adult education community in western New York, in line with the second indicator for this goal.

Most of the activity in pursuit of this goal has been conducted through informal integration into project participants' ongoing "normal" role functions rather than as part of a deliberate strategy to act upon the goal and its indicators. That is, as professional educators, administrators or evaluators, the participants often make presentations at professional meetings. Since the CLCI project was one of their primary activities and interests during this 3-year period, it was natural to present on the project at these meetings. That these activities helped promote the goal was somewhat incidental in that the presentations would likely have been made even absent this goal.

The presentation and discussion with the OCM BOCES Workforce Consortium Advisory Board described above, however, was a key exception to that incidental set of activities. This presentation was part of the CPT's deliberate strategy. It was intended to explore the possibilities and perhaps get started on the work with the affiliates of the NY State Consortium for Staff Development. The presenters gave an overview of the CLCI model and project and engaged the group in a discussion of the dissemination potential. No concrete follow-up activities emerged from the meeting, however, to this point.

Because of the dearth of formal activity and concrete program continuation or adoption in this goal area, the formal tracking system of the third indicator was not established.

IV. Summary and Discussion

To briefly recap, the CLCI project had four major goals:

1. Provide a continuous-improvement support structure for local EPTs
2. Develop and test the model which integrated the WNA, EPT, problem-posing curriculum and portfolio assessment components
3. Demonstrate program impacts on the workers, the workplace and the business/union commitments to worker education
4. Promote continuation of the program at existing and new sites across New York State.

Overall, the second goal was the area of most accomplishment. The development and testing of the CLCI model is the area in which most of the project efforts took place and where almost all indicators were met by most local sites. The first and third goals, support structure and demonstrable impacts, were also accomplished at a high level. The fourth, promotion of the program's continuation, was not a particularly strong area of project accomplishment. A summary and discussion of the major accomplishments and difficulties in each goal area follows.

Goal 1: Continuous improvement support structure

Goal 1 is essentially embodied in the CPT. The CPT was originally mentioned, in the first statewide training session, as one of a number of features to put into place at the project's outset. Because of the numerous steps that each site had to take initially, the CPT was not initiated at that time and seemed to have been forgotten. After a few months of work and a few statewide meetings, the idea was renewed out of a response to a need expressed to have site participants help plan an upcoming statewide training session. From there the idea evolved into the official stakeholder-based, participatory governing body for the entire project, and met regularly. The CPT became a body in which most members appreciated the opportunity to participate. Participation provided them with the valued sense of belonging to a larger effort and working toward a vision larger than their day-to-day operations, among several other benefits described in the report. The group's evolution also incorporated improvements in specific operational procedures, such as who would facilitate the meetings, how formal meeting information would be communicated, and shoring up some site and stakeholder representation gaps that became apparent. For most of its term the CPT performed well the major functions of setting goals and their indicators, monitoring progress toward goals and self-correcting when needed and planning site support activities.

There were some shortcomings of the CPT, however, in comparison with its ideal operation. Participation of business/union partner representatives was almost nonexistent, despite a few concerted efforts by some CPT members to increase the business/union involvement. The lack of timeliness and continuity of written meeting proceedings may have been factors inhibiting the group from being as effective as it could have been. Finally, the momentum of the group waned during the project's last eight months. This may have resulted from: (1) the fact that some local sites that had their programs going very well and didn't need further support; (2) the lack of continued interest or hope by those sites that had little or no activity for most of the third year; and (3) termination of the National Workplace Literacy Program.[19] These factors contributed to the CPT's loss of momentum during the time when it would have been most appropriate to pursue the program continuation goal.

Goal 2: Develop and test CLCI model

Goal 2 consists of four major components and their integration. The first component is the WNA. One was conducted at least fairly extensively in six of the seven sites at or near the project's outset. The WNA procedures used at the sites were usually of the broad scope articulated in CLCI's ideal. They had both the explicit outcome of identifying reasonably clear needs and the implicit benefit of building the foundation of the partnership between the educators and their respective companies. This foundation, when attained through extensive discussions at all management, union and operations levels, seemed to have set up the relationships, interaction protocols, and at least a start in the mutual understanding that helped integrate the workplace education program into the company culture. With that foundation, the senses of the workplace needs were much clearer and more widely shared, and decisions about programming and instruction come much easier and with minimal logistical problems. Further, the problem-posing curriculum part of the model was enhanced because the learning teams' "solutions" to problems could be communicated to management along the ways already paved through the WNA.

An extensive WNA was not conducted by all sites, however. In one case, the process was much abbreviated. The union already had a clear sense of immediate needs and used that, and its prior work in needs assessment, to form its initial training. It later recognized some shortcomings in the process that might have been overcome had a more extensive assessment, including more stakeholders, been conducted, and it implemented such a process during the second year. This example illustrates that, while not all may be lost if the ideal WNA process is

[19] This last reason may have prompted education partners to begin looking elsewhere for future program funding, believing that other government funding would have a greater likelihood of program continuation than would further efforts at the existing companies.

not completely followed, it may be more difficult to implement the other elements of the full model.

Besides positing, as the model does, that by conducting an extensive WNA one can then integrate the educational program better with the company culture, the process is more complex. First, the implementation examples seen among the sites suggest that there is probably a set of conditions that need to exist in both the company and the education partner to make such an ideal WNA possible. If the company's top authority sees needs only in terms, for example, of, traditional basic skills and will only allow them to be assessed through a standardized test, then it will take much work, patience, compromise, and perhaps persuasion on the educator's part to develop a change of perspective among the corporate parties. It also takes an education partner who agrees with, and preferably is committed to, the perspective espoused by the CLCI model, to insure the motivation to work through the barriers. Second, implementing a truncated WNA process can be a first step toward the complete process. There are examples among the sites in which conducting a limited needs assessment and a limited program following from it, gave time to build a level of comfort among the various stakeholders, and allowed the union and management to expand the scope of the WNA to which they would agree in subsequent cycles.

The EPT is the next component of goal 2. The EPTs functioned quite well at most sites. It is possible to develop an ideal set of EPT specifications, including, at a minimum, monthly meetings, involvement of each stakeholder group at each meeting, active worker participation in the deliberations, formal and regular goal assessment and reporting, and so forth. In actuality, however, another key element of the model is to integrate this program with the company culture. That element makes it appropriate that the EPT modify those logistical ideals to fit into the circumstances of the company's organizational climate. Specific adaptations made by the CLCI sites were detailed in the report.

The one part of the EPT functioning that most often presented difficulty was worker participation, both concerning being released from operations to attend meetings and being truly active participants. While it is often easy for a company to initially commit worker time to EPT participation, when there is a conflict between production pressure and an EPT meeting or class participation, production wins out. This may be understandable and must be accommodated by the EPTs and the CLCI model. Active participation was less of a problem in the workplaces that had previously adopted participatory work teams. Another problem, though less frequent than the first, was that of management participation. In most cases, there was participation by one or more managers; however, they were not always consistent, regular, or from a sufficiently high organizational level to be as effective as was often needed.

Planning and conducting the instruction has two essential subelements: problem-posing curriculum and student portfolio assessment. The problem-posing model is considered a great

success, in that most sites followed the parameters of the indicators for this subgoal. They developed curricula out of worker-generated operations problems, saw them through to closure in proposed solutions, obtained at least an open minded response from their communications with management, and in more than half the cases implemented the solutions fully or with modification. The details of the types of problems addressed and what was done about them are provided among the findings. The initial presentation of this component early in the report stated that what constitutes a problem for this model has been a matter of ongoing, lively discussion. The understanding that emerged among the CPT seems to be that a "problem" may be specifically production-related (e.g., old conveyor system produces high waste and injury rates), a broader issue that is related to the workplace (e.g., worker benefits program), and its solution or improvement in the situation surrounding it bears fairly directly on improvement in the workplace (e.g., better knowledge of and skill with SPC).

Over time, questions about this type of instruction developed. Were the traditional basic skills of reading, writing and math adequately addressed through the problem-posing vehicle, as was part of the original vision for the model? How extensive and valuable were the demonstrable effects of those classes? Some sites, out of concern about the first question, began to offer more focused basic skills classes within a strong workplace customized context, but these were separate classes in addition to the problem-posing classes. The second question, about demonstrable results, was answered in detail earlier by showing that the classes seemed to have had both extensive and valuable effects.

One of the chief difficulties with developing and implementing the problem-posing curriculum was the uncertainty for the teachers of developing and teaching something new for which there was little, if any, precedent in their training or experience. Near the start, many teachers didn't always feel sure of what they were doing with the curriculum and instruction. It often required their adapting to new roles as facilitators to draw ideas out of their classes and to build upon that into the longer-range plan rather than instructing in well defined sets of skills or information. To their credit, most teachers in the program worked through those uncertainties.

A second difficulty was that sometimes the floor worker participants did not have confidence in their abilities to be effective in addressing job-related problems, usually in their experience a function of managers and engineers. They also had to learn new roles.

The student portfolio assessment part of Goal 2 was less successful across the entire project. Only two sites used it to a significant extent at the individual student level for the integration of assessment and learning, a careful assessment and presentation of evidence keyed to course objectives, progress assessments, and development of individual learning plans. Those two sites used the portfolio assessment only in more conventional basic skills in the workplace context, not in the problem-posing courses. The other sites that did attempt to use them did so

with the portfolios as repositories of information for individuals or groups, information that was perhaps scanned to get a holistic sense of the progress and needs of the group. During the early stages of the CLCI, site personnel discovered that most of them had too superficial knowledge of portfolio assessment to apply it to adults in the workplace settings. Moreover, training resources were too limited to allow this project to obtain the additional training needed. Even those staff who had training available to them from other sources found the application of portfolio assessment concepts to the team-based problem-posing curriculum difficult or impossible.

Goal 3: Demonstrate results

This project had an impact on the participating workers, workplaces, and, to a lesser degree, business and union commitment to workplace education. The evidence for the workers has generally focused around communications skills, problem-solving strategies, teamwork, computer skills, and math skills, all in their very specific work contexts. Most of that evidence is anecdotal in reports from workers, their teachers, supervisors, and company and union managers, though a few surveys assessing in-class learning and follow-up use on the job provided more systematic data. While gains have been made, one cannot say how good they are without standards or another comparison base so lacking for workplace education. Results across sites cannot be compared or quantitatively combined in this project because each site's outcomes were customized in keeping with their respective program objectives.

The evidence for the workplace impacts seems reasonably substantial, though uneven across the sites. As detailed in the findings above, anecdotal reports abound detailing smoother work flow, fewer defects, increased morale and confidence, better interactions between operators and supervisors and managers, and cost savings. Two companies provided actual workplace data that relate somewhat clearly to their classes in this project. Both of those show large positive outcomes, in cycle time, scrap reductions, and timely customer order fulfillment. Each result provided by the sites and presented earlier in this report was of the magnitude of about 150% to over 500% improvement. Increases like these after training programs are at the low end of what are generally shown in the research reporting training effects on the workplace. Those published research results, however, are for targeted skills training programs (e.g., new sales systems, new machine operations, new supervisory approaches, etc.), not more general training such as CLCI's. In the targeted skills programs, all other things being equal, one would expect more

pronounced impacts than for CLCI's more general training. Thus, these impacts seem quite strong.

One of the desired outcome areas is the business/union commitment to workplace education. The evidence of the extent of commitment is uneven across sites. Most sites report that the companies or union had a high commitment to worker education at the outset of the project and that commitment remained high. There was generally a marked change in the company or union management perspective on workplace education, however. These companies see the benefit of having their education programs conducted in a way that is integrated into the company's broader organizational development and restructuring activities rather than piecemeal to address only targeted work skills. One site has made "permanent" a structure which integrates the participatory aspects of the CLCI into their broader education and training function and another has committed funds to hire a full-time educator to continue providing similar programs.

Goal 4: Program continuation

The informal efforts regarding program continuation were extensive. For the formal activities of the deliberate strategy outlined by the CPT, efforts did not go very far. The groundwork laid in this area will be continued in the 6-month project extension. Perhaps a 6-month or 1-year follow up evaluation would provide evidence of more continuation and expansion.

Conclusion

The workplace education projects funded by the USED, of which the CLCI is one, had a dual intention. One was to conduct activities that would have positive impacts on the participating workers and companies. This project demonstrated that it met that intention. The other intention was as a demonstration project, to develop the knowledge base about worthwhile practices in workplace education. The special strengths of the CLCI in its development and testing of the model (Goal 2 above), and the strong interest in its operation and results by national audiences, make this project a valuable contribution to the field of workplace education.

APPENDIX

Selected Worksheets from Site Evaluation Portfolio Manual

Continuous Learning for Continuous Improvement

Site Portfolio Guide/Year 3

'Start-up Checklist'

These are examples of evaluation forms and processes that you will need to have in place in order to complete the Site Portfolio in general and the Instruction Tracking Sheet in particular. Review them for each course or instructional unit and make a note of the forms you need to develop to gather adequate data.

Site: _____ Date: _____

Course/Instructional Unit: _____

Evaluation tools you will need	✓ In place	What you need to do to develop tools...
Level #1. A way to capture participant's reaction to the class or instructional unit. For example: • participant's survey • interviews of participants • other		
Level #2. A way to assess the extent to which participants' learned what you wanted them to learn. For example: • written pre/post test • participant self assessment • teacher observations • other		
Level #3. A way to assess the extent to which participants are applying what they've learned at work. For example: • interviews with participants and/or supervisors • surveys with participants and/or supervisors • other		

Evaluation tools you will need	✓ In place	What you need to do to develop tools...
Level #4. A way to assess what, if any, effects worker participation in class/instruction is having on the workplace. For example: • scrap rates • safety rates • numbers of customer complaints or inquiries • supervisor reports of improved efficiency		
Level #5. A way to assess what, if any, return on investment the company sees from the education program.		

Continuous Learning for Continuous Improvement

Site Portfolio Guide/Year 3

'Instruction Tracking Sheet'

Program Site:_____ **Dates Form Completed:**_____

_____

_____

1. The Students and Type of Instruction. Describe the students who participated in the instruction and the type of instruction offered. Include all the appropriate information that helps to distinguish this group from others. Answer only those questions that apply.

- Title of class_____
- Class cycle number_____
- Dates of instruction_____
- Title of team or other group to whom instruction was provided_____

_____

(Specify if front-line worker, supervisors, or both participated)

- Other distinguishing information_____

2. The Problem. What was the 'problem' that determined the instructional focus of this class? Taking into consideration that 'problem' may be defined narrowly, broadly or somewhere in between, please describe the problem fully and concisely.

3. **Closure.** Was closure brought to this 'problem' or not? By closure, we mean some clear sense that the problem has been solved, an approach to solving the problem is articulated, or a decision has been made to drop the problem.

Circle one and then **describe** the closure to this 'problem.'
Yes No Not Sure

Description:

4. **Implementation Status.** What happened with whatever the class/team brought to closure? If nothing was implemented, why wasn't it?

5. **Management involvement or response.** Describe if and how the class interacted with management. Did managers participate in the class? Did class/team members make written or oral presentations? During class term or after? How long after? What was management's response?

6. Class results. The following five 'levels of evaluation' are taken from the Kirkpatrick evaluation model. We have allotted a half page for reporting of evaluation results for each Kirkpatrick level. You might need more or less space. Be creative.

If your data for the Kirkpatrick levels is not by class but by some other unit -- for example, three classes aggregated -- then you may still use this format for ease of reporting. Just describe the units for which you are reporting and attach the results to these forms with clear identification.

6.1. Kirkpatrick level #1: Reaction to class

- What tools did you use to gather your data?

- What did you learn about students' reactions to the class/other instructional format?

6.2. Kirkpatrick level #2: Learning in class

- What tools did you use to gather your data?

- What did you learn about what students learned in class?

6.3. Kirkpatrick level #3: Applications to workplace

- What tools did you use to gather your data?

- What did you learn about how students apply what they learn in class/other instructional format to the workplace?

6.4. Kirkpatrick level #4: Workplace effects

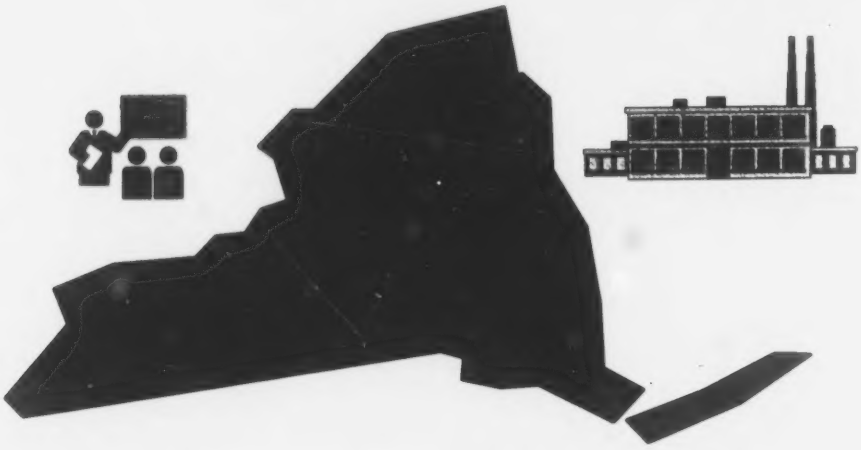
- What tools did you use to gather your data?

- What did you learn about how workers' participation in the instructional program has affected business?
- If necessary, attach company's original data charts, graphs or tables and describe what they say or what you conclude from them.

6.5. Kirkpatrick level #5: ROI

- What tools did you use to gather your data?

- What did you learn about how workers' participation in the instructional has affected actual cost savings and/or cost savings' projection. If applicable, please describe the amount of actual cost savings over what time period and/or any projections for cost savings that result from the 'solution.' If necessary, attach company's original data charts, graphs or tables and describe what they say or what you conclude from them.



Collaborative Learning for Continuous Improvement

Evaluation Final Report

Volume III:

The CLCI Model: Vision and Realization

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November 1997

PREFACE and ACKNOWLEDGMENTS

The Collaborative Learning for Continuous Improvement (CLCI) project was conducted under a grant from the U.S. Department of Education's National Workplace Literacy Program to the New York State Education Department from November 1994 through October 1997. The grant was to provide workplace basic skills education for employees in seven manufacturing companies across the state in partnership with five education agencies.

This is one of four volumes of an evaluation report for the project. **Volume I:** ***Executive Summary*** provides an overview of the evaluation results. **Volume II:** ***Program Goals and Accomplishments***, includes a presentation and analysis of findings about the extent to which the project accomplished each goal. There the outcomes from individual sites are detailed and an attempt is made to synthesize these outcomes across sites to present an overall picture of statewide accomplishments. **Volume III:** ***The CLCI Model: Vision and Realization***, describes the original vision of the model and analyzes its strengths, difficulties and the adjustments made to the vision as the model was implemented over the 3-year period. Volume III concludes with a discussion of what the project learned about workplace education through the experience, learnings that may be helpful for those planning, developing, or thinking further about workplace education. **Volume IV:** ***Site Portrayals***, provides a detailed picture of each site as a whole, its context, how it implemented the model, what it achieved, and what lessons might be learned from the experiences at that site. This volume is intended to give readers a grounded portrayal of the life of CLCI in its real settings, and perhaps to afford readers the opportunity to form their own sense of how the model is differently implemented in various contexts.

The work of the CLCI project involved the continuous efforts over a 3-year period of several individuals who participated regularly in the project's Central Planning Team, most of them in addition to their work at local sites. These included:

- Bob Knower of the New York State Education Department
- Paul Jurmo of Learning Partnerships in New Jersey
- Mike Armstrong and Margaret Shirk of Hudson Valley Community College
- Paula Hayes of the Onandaga-Cortland-Madison BOCES
- Karl Kania and Tom Wager of the Rochester City Schools Family Learning Center
- Bev Zier and Diane Spang of the Wayne-Finger Lakes BOCES
- Stan Swider of the Schuyler-Chemung-Tioga BOCES.

Others made significant contributions during their involvement in limited parts of the project, namely:

- Judy Lees of Hudson Valley Community College
- Sid Mann and Fran Simone of the Schuyler-Chemung-Tioga BOCES
- Chris Schwenker, Sheryl Grana, Joe Horton, Tricia Lum, Andy Mendola, Traci Panaro and Gina Porter of the Rochester City Schools Family Learning Center
- Sue Follinsbee of ABC Canada

- Ed Cohen-Rosenthal of the Cornell University School of Industrial and Labor Relations.

Additionally, representatives of the business partners spent considerable time working with the education partners, adjusting the efforts at their companies to effect some mutual adaptation with the project, sharing their thinking about workplace education with us as evaluators, and sometimes participating in statewide activities, including the CPT. These include:

- Vince Partisano of Albany International Corporation, East Greenbush
- Linda Holland, Marv Meissner and Bonita Lindberg of Albany International, Homer
- Al Zwack and Colleen Hyatt of Albany International, Menands
- Patti Campbell and Bob Trouskie of UAW Local 1097 at Delphi Energy Systems, Rochester
- Cynthia Schwab of EGG Wright Components, Phelps
- Mike Werner of Elmira Stamping, Elmira
- Joel Cummings, Maryann Lesnieski, Donita Mayes, Christie Nunn and Shyrl Orrego-Scalice of Eastman Kodak Corporation, Rochester.

Making a different kind of contribution was Gordon Quimby, who provided editorial review to the nearly final version of these reports. His lack of involvement in workplace education was particularly valuable in translating much of the shorthand terminology we've all come to use without thinking about who outside our circles understands it. We hope that we took his suggestions often enough and used them well.

We appreciate the efforts of all of the people above and enjoyed the opportunity to work with them during the project. They helped make the work most stimulating and enjoyable. In addition to the thinking they did to help develop and implement the project, their comments and questions helped us stimulate and clarify our own thinking. Thus, they can be said to have contributed to many of the ideas in this series of reports. As the ones who put it together on paper, however, we take responsibility for any errors or misinterpretations herein.

Don Cichon
Laura Sperazi

Volume III: The CLCI Model: Vision and Realization

CONTENTS

	Page
I. Background of the CLCI Model	1
II. Model Components	5
The Educational Planning Team (EPT)	5
Workplace Needs Assessment (WNA)	8
The Instructional Program	12
Problem-posing curriculum	12
Portfolio assessment	16
Evaluation Process	19
Outcomes	21
The Central Planning Team (CPT)	24
III. Key Lessons from the Overall CLCI Model	27

APPENDIX
Original Proposal Assumptions
Statewide Goals

I. Background of the CLCI Model

Collaborative Learning for Continuous Improvement (CLCI) is a workplace education project funded by a grant from the U.S. Department of Education's National Workplace Literacy Program to the New York State Education Department (NYSED). The project was funded from November 1994 through October 1997[1]. It consisted of partnerships between seven manufacturing companies and five education service providers across the state.[2]

An overarching principle of the project was that all participating businesses are involved in some stage of movement toward becoming high-performance workplaces[3]. The participating partnerships were all committed to developing programs that support the businesses' ongoing restructuring initiatives. Project activities were intended to fit into and further promote restructuring efforts, and the activities are generally implemented in a way that models high-performance practices. The project itself sought to be a high-performance workplace education organization -- thus the adopted name *Collaborative Learning for Continuous Improvement*.

The sites operated their programs under the guidance and coordination of a Central Planning Team (CPT), composed of representatives from each site and four other members: one from NYSED, one outside curriculum consultant, and two external planning and evaluation consultants. The CPT developed a set of goals for CLCI that were derived from several principles embedded in the original proposal to the National Workplace Literacy Program.[4] During the first year the CPT realized that its principles and goals were evolving into a somewhat structured model of workplace education development and delivery that was being adapted and tested in each site.

The CLCI model is shown graphically in Figure 1, including its main components and some of the primary relationships among them. A fuller description of each component is provided in Section II, the main part of this report. A brief introduction to the key components, however, is provided here. At the site level, within the center frame of the figure, an Education Planning Team (EPT) is formed that includes representatives

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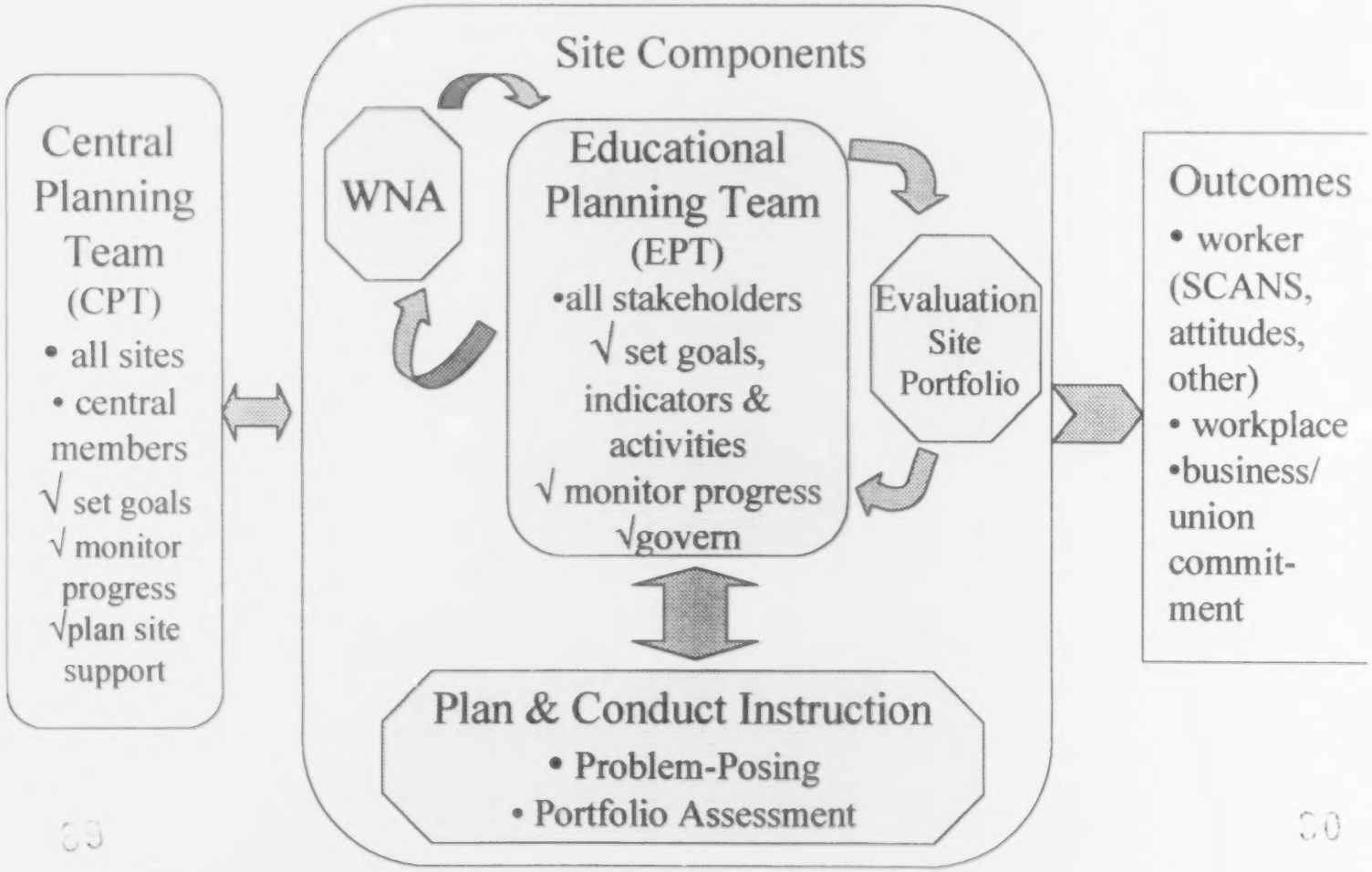
[1] Plus a 6-month no-cost extension to conduct dissemination activities.

[2] The seven partnerships, or sites, are listed in the Preface and are described in more detail in **Volume II**.

[3] Ray Marshall, former U.S. Secretary of Labor, delivered at conference on "High Performance Work and Learning Systems," Washington, D.C., September 26-27, 1991.

[4] See the Appendix for a list of the original principles and the CLCI goal statements.

Figure 1. CLCI MODEL



from all stakeholder groups to govern, plan and monitor progress in the program. One of the first tasks of the EPT is to conduct a Workplace Needs Assessment (WNA) that identifies the types of organizational and educational concerns that a workplace education program might address. It uses those results to plan the instructional program, incorporating at least two components. One, the instructional staff and participating workers further identify a problem whose solution will benefit the workers and the organization, and around which instruction can be designed. Two, instructional staff use portfolio assessment to document individual and/or group progress toward finding a solution to the problem and toward improving the workers' basic skills needed to find and apply the solution. Also, as part of the instructional program, solutions are presented to management and, with management's approval, and sometimes adaptation, these solutions are implemented in the workplace.

Evaluation is conducted internally by the EPT. Through this process the EPT can monitor the extent to which the site's program is attaining its goals, make adjustments as needed, and work toward continuous program improvements. The evaluation can also demonstrate if the solutions to worker-identified problems -- the results of instruction -- benefited the workers, the company and the program.

Since in the CLCI multiple sites deliver services under a single funding, administrative, and content direction umbrella, a CPT (left frame in the figure) is convened to govern the project and to model the high performance behaviors expected at the sites in the EPTs and other activities. Finally, an external evaluation of the entire project (right frame) is conducted.

At the simplest level the model might be understood as a trajectory of organizational and educational activities that move from the starting point along a path of key activities toward a goal – improved worker basic skills through the solution of workplace "problems." These key activities have at their core the support of workers' participation in their work and related educational development process, which are assumed to strengthen the organizational infrastructure and improve the business outcomes. However, at another level, the components of the model are highly interactive and usually function in an iterative and interactive manner rather than as a single linear trajectory. For example, although the EPT convenes initially to conduct the WNA, it meets throughout the life of a program and continuously interprets results and needs. It may decide to conduct a second or third WNA to assess new needs or next steps for a program rather than rest with information gathered at the beginning of a program. As results become evident in evaluations of workers or the organization, the EPT may

redefine the types of problems the instructional program should address and who needs to be involved in that redefinition.

The purpose of this report, Volume III, is to present the CLCI model as an ideal type and then to explain how it was adapted in the sites and the extent to which it achieved the desired results. What follows is:

1) A description of the "vision" of each of the components of the CLCI model and their relationships to one another, illustrated with some examples of how the vision was "realized" in the participating sites;

2) An analysis of the strengths of each of the model components, the problems sites encountered while trying to implement the model, and the adjustments made to the components by sites; and

3) Conclusions about strengths and weaknesses of the model overall.

II. Model Components

The Educational Planning Team (EPT)

Each site begins its work in this model by forming a group that is composed of representatives of all stakeholders in the program and that meets regularly to plan and govern the program. Typically this planning and governing group would include a site coordinator and/or teachers; management -- either upper-level (often the HR Director) or supervisors, or both; workers who will likely receive, or have received, instruction through the program; and union representatives where applicable. Ideally, democratic representation of stakeholders' views insures that sites develop dynamically, with discussion about the various perspectives on what a site can accomplish. EPTs are expected, at least, to set program goals, conduct a WNA, inform curriculum development, and monitor progress through internal evaluations. Ideally, EPTs carry out these tasks in regularly scheduled meetings.

The EPTs functioned well at six of the seven sites. In the first grant year, most EPTs were composed of managers, workers, and educators and they met regularly, usually monthly. With one exception (in a site where support for education was generally tenuous) business people and educators agreed that the EPT was the cornerstone of their programs. Without an EPT they would not have had a formal vehicle for developing and carrying out their programs.

If the CPT had developed an ideal set of specifications for EPT activities -- such as minimum number of monthly meetings, near perfect participation of each stakeholder group at each meeting, active worker participation in the deliberations, formal and regular goal assessment and reporting, and so forth -- we would be able to rank the sites along a continuum of how well they did all the "right" things. In actuality, a key element of the model is to integrate this program with the company culture. That element makes it appropriate that the EPT adjust from any logistical ideals to fit into the company's organizational climate. The result of this "cultural" orientation is that some EPTs met as often as weekly during periods of intensive planning but, by the second year, communication among team members often became more informal. Key EPT members, especially site coordinators and the business or union representative, would communicate as needed -- often quite frequently -- but not within the formal structure of the team. This happened, in part, because the felt need for regular formal meetings diminished once the foundation of the program was established. After intensive collaborative planning, some teams decided, either explicitly or implicitly, that their program could be operated efficiently on a more informal basis. Decisions to work less formally were also the result

of difficulties convening full teams with adequate supervisor and worker representation and the sense among some managers that regular formal meetings were not "value added."

One site, however, met bi-weekly throughout the three year period with one slow down during a period of heavy production. In this site, the EPT was composed mainly of workers (six to eight in each meeting) and was directed in large part by an HR representative who had support from her corporate superiors to work intensively with the EPT. The structure of this workplace education program is roughly comparable to other education and training programs in the company so both workers and managers felt very comfortable with the structure. Both educators and business people in this program agreed that "this is the perfect way to do this work." Educators find it a satisfying environment in which to work because the company truly collaborates with them. On the other hand, it is a demanding environment for educators. The EPT in a high performance workplace is a demanding audience and educators have to work hard to maintain high standards. They also they have to demonstrate results to keep the momentum going. It is telling that, of the seven projects, the three that demonstrated the most visible and well documented results on workers and the workplace were the three with EPTs that met more regularly than at the other four sites.

The EPT's strengths:

- The EPT integrates the education program with company culture by being a place where both educators and business find their common purpose and give meaningful form to their programs.
- The EPT encourages the stakeholders to bring their different perspectives about education, training and work organizations "to the table" and to discuss them openly. Such discussion is necessary so that agreement about what a good program looks like can be achieved.
- The EPT helps to build a sense of the education program as a whole process, not just a collection of courses. It is a tool that can be used as needed by either partner or both together to continue to respond to new needs as they emerge. It thereby reinforces the image of the education program as a process that is part of the ongoing life of the company. This function of the EPT increases the likelihood that the company stays involved in the program beyond the initial program planning stages.
- Worker representation on the EPT helps to insure that these "customers" have a voice in how their program is designed and carried out. In this way, the EPT functions like a quality improvement process. Workers help to set the quality standards for their own programs.

- The participatory, problem-solving structure of the EPT is essentially a high-performance structure and therefore models a key object that the education program intends to teach.

Difficulties associated with EPTs:

- It is often difficult to obtain and maintain even limited front-line worker involvement in the EPT. Scheduling difficulties, shift changes, needs "on the floor" at more pressured production times, and sometimes less than full employee interest or management support for employee involvement in these meetings have all made it difficult for workers to attend EPT meetings regularly. This difficulty existed, at least to some degree, in four of the seven sites. This is less of a problem in workplaces that have previously adopted participatory work teams, although it is sometimes still a challenge in those settings.
- The limited power that floor workers at some sites have or perceive themselves to have over program decision making exacerbates the problem of low attendance. This means that when workers do attend meetings they do not always participate fully. While some sites tried to address this problem, no systematic or effective strategy emerged from any site.
- It is also sometimes difficult to maintain management's involvement in the EPT meetings. Supervisors are often preoccupied with production issues and left the education program to the educators.
- Shift and team changes frequently make it difficult for the EPT to stay on task. In one site, for example, workers changed shift every six weeks. If the EPT wanted to maintain regular worker membership, it would have had to take these shift changes into account when it set its meeting schedule. After a point, it became too difficult to keep up with the changes.
- Some sites find it difficult to maintain regular EPT meetings during interim periods between courses. The presence of the educators on site and the fact of ongoing instruction seem to keep the need for the EPT visible. Without that presence, unless educators or management representatives made a conscious decision to conduct them, EPT meetings were set aside.

Adjustments to the EPT component:

- In companies that have not previously had participatory work teams, the EPT has to introduce basic principles of participatory management. In these cases, the EPT has to particularly address the needs of worker participants and supervisors who may be uncomfortable with participatory style. In companies where participatory work teams

are in place but the language of high performance exceeds the practice, the EPT has to model, and potentially promote, the practice.

- EPT members have to find the right balance between formal, regular meetings and informal communication. EPT member communication takes place informally, outside of EPT meetings. While this serves many programs well, there is the danger that some stakeholders are taken out of the communication loop, with negative impacts. At the same time, it might not be good to force continuous meetings if they are not seen as productive.
- Although the EPT was originally seen as a planning and governing group, in some cases, and for a period of time, it may fulfill a planning function only. Educators or managers may take over the governing function.

Workplace Needs Assessment (WNA)

Before it sets goals for its program, the EPT conducts a Workplace Needs Assessment. A WNA is a process for assessing the full scope of workplace needs, at both the employee skills and the organizational levels. It includes but is not limited to gathering information from those people whose needs the workplace education program is expected to meet. A WNA is broader in scope than a literacy task analysis or a functional context approach to workplace education, though it may include elements of those. It helps the EPT to make realistic judgments about what a literacy program can and cannot accomplish, helps to facilitate the integration of workplace and education goals, and introduces educational staff to the workplace, in particular to workers, supervisors, and managers. The WNA also helps the EPT to identify specific workplace problems which can serve as the focus of instruction in the problem-posing curriculum.

The WNA involves gathering information from a sample of the workforce across all organizational levels and examining selected policies and practices within the organization. It does not, therefore, provide an assessment of any one person's needs or skills. Nor does it provide an analysis of the basic skills needed for specific jobs. A basic skills task analysis of certain jobs might, however, be appropriate if a WNA provided evidence of the need for a task analysis. The information gathered in the WNA allows the EPT to identify similarities and differences in workforce perceptions about the need for education and the role that an education program might serve in the organization. It also allows the EPT to assess, on the basis of evidence, an organization's readiness for change. This is especially important in the CLCI model because the guiding principle of the CLCI is to support companies in becoming high performance organizations. The WNA can reveal attitudes toward learning, management style, management-labor relations,

communication style, equity issues, etc., which shed light on how the high performance model is being developed. It shows the EPT where and how to start an education program that will have the support of the organization.

Six of the seven local projects conducted extensive WNAs. In most of these six, the EPT held lengthy discussions with a range of stakeholders -- including management, supervisors, employees and teachers -- about the goal of the WNA. Then they administered written surveys and/or conducted focus group discussions or individual interviews with representative samples of workplace personnel. In the larger companies, the EPT studied large samples; in the smaller plants, they usually gathered information from virtually all the employees.

An example of a thorough WNA is seen in this description of one selected site. The program coordinator met with the HR director and a small group of employee representatives to discuss the general orientation and possibilities of the program, worked out initial differences in orientations to workplace education, and planned an extensive and broad-based set of interviews with employees. She then conducted interviews with 84 people (the majority of the total employees at the plant), 27 salaried and 57 hourly, synthesized the results, and discussed them with the EPT over an extended period. Out of these discussions they generated program goals and a training structure. The results yielded significant results at two levels. They articulated, first, a clear sense of the overall orientation to training in the plant, stating that "a philosophy of building knowledge and process improvement is ingrained in the culture of this organization" and, among both salaried and hourly employees, there was "a strong desire to develop an understanding of the principles and knowledge that determine the processes and changes in their work, both at the level of their specific job titles and in the context of the company itself." At the second level they articulated a more detailed, prioritized list of skills to address in the training: 1) communication, 2) math, 3) computer skills, and 4) job-specific skills in the context of the plant's total business framework.

Another site offers an example that illustrates still different WNA features. This site did not complete an extensive WNA during the first year of the grant. Union representatives indicated that needs assessment information was collected regularly as part of ongoing processes at its plant, and that it was clear from recently assessed needs that an SPC math skills training program was needed for a new area of the plant. The site then conducted that part of the training. At about the mid-point of the project the site staff conducted a more extensive special assessment of team-building needs for all areas of the plant, the results of which were used to design and implement a new cycle of training. EPT members learned that the SPC course opened up new avenues for working that

engineers and managers had not expected. Workers took more initiative in solving problems and in communicating well with SPC related information. This caused some friction and role confusion in the production unit which required some technical and social adjustment and resolution. EPT members realized that, had they conducted a complete WNA at the start of the program, they might have discovered the need for supervisors to be brought into the training loop and would have designed the SPC math skills training program accordingly. The resolution at the organizational and training level was to involve managers more integrally and continuously in planning and conducting the next round of WNA activities and in the training.

The WNA's strengths:

- The WNA sets up the relationships, interaction protocols, and mutual understandings that help integrate the workplace education program into company culture. With a WNA, workplace needs are clearer, broader and more widely shared, and decisions about programming and instruction come more easily and with fewer logistical problems.
- Through the WNA process educators and the workforce establish a rapport, come to understand each other's perspectives better, and begin to develop trust in each other. The issue of trust is often a special problem, particularly among hourly manufacturing workers who sometimes view trainers and training purposes with some suspicion or skepticism.
- Education partners deepen their understanding of the complexity of their roles beyond what they formerly saw as just "teaching content" and making sure it included some workplace examples. They become keenly aware of how prior employee training experiences affect trainee attitudes, motivations, and learning capabilities and how larger corporate or plant issues positively or negatively affect employees' abilities to translate what they learn into job practices. In addition, they became more aware of the changing nature of jobs in high-performance organizations where workers need to apply what they learn almost immediately.
- The WNA builds overall investment in the education program. No one group or individual is singled out as an informant. Workers experience less threat in speaking as a group about what the organization needs.
- The education program that results from WNA findings is less likely to take on unrealistic challenges or set unrealistic goals because the EPT is sufficiently grounded in real organizational needs and limits.

- The direction and content of the problem posing curriculum is derived directly or indirectly from what the WNA reveals about workplace needs.
- The WNA builds a foundation for partnership in day-day program operations.

Difficulties with WNAs:

- The attitude that conducting a WNA is too time-consuming for what the benefits derived may interfere with conducting one. A few managers suggested that they already knew what the WNA had to teach about organizational needs and the role of education and, therefore, the only value of the WNA was to orient the education provider to the workplace. Considering the time involved in conducting a WNA, it was seen as non value-added. A variation on this theme from an instructor's perspective is that it is easier to identify problems for the problem posing curriculum through a problem-solving group than through a WNA.
- When educators identify controversial organizational issues publicly they run the risk of being criticized for doing so. Unless the partnership between educators and business people is so well established that educators can speak with the voices and authority of "insiders," they run the risk of being seen as "outsiders" poking around in business that is not theirs. Workplace educators are sometimes challenged to exercise skills in diplomacy and organizational psychology that are not included in a traditional adult educator's job role.
- The WNA may highlight disagreements between management and floor workers, or even within groups, about what the real problems in the organization are. While this can be advantageous as a starting point for the problems' resolution, such results may prove a further problem if the environment does not support the resolution of problems between management and floor workers.
- The WNA may sometimes be short-circuited because, for example, an already existing needs analysis has shown management what an education program should address.

Adjustments to the WNA component:

- There is a set of conditions that need to exist in both the company and the education partner to make an ideal WNA possible. They include the company's and educators' willingness to entertain a broader definition of workplace basic skills than is traditionally offered and to invest the time and thought in the WNA process. If the company's top authority sees needs only in terms of traditional basic skills and will only allow them to be assessed through a standardized test, then it will take much work, patience, compromise, and perhaps persuasion on the educator's part to develop a change of

perspective among the corporate parties. It also takes an education partner who agrees with, and preferably is committed to, the perspective espoused by the CLCI model, to insure the vision and motivation to work through the barriers.

- Implementing a truncated WNA process can be a first step toward the complete process. Conducting a limited needs assessment, and a limited program following from it, may give time to build a level of comfort among the various stakeholders, allowing, for example, union and management to expand the scope of the WNA they would conduct in subsequent cycles.
- Results of WNAs do not always guide the development of program goals in linear fashion. Typically, the EPTs had a clear sense of the goals the program should pursue before the WNA. The WNA either verified the validity of or refined the statements of those goals or the goals were developed concurrently with the WNA data collection so that each informed the other during the development process.
- Conducting a WNA requires more time and effort than most educators assumed.

The Instructional Program

Two key instructional features are singled out for special attention in the CLCI model: problem-posing curriculum and student portfolio assessment.

Problem-posing curriculum

In the CLCI model, curriculum development is driven by workers' identification of workplace problems for which workers generate solutions during the course of instruction. This type of curriculum appears to be part of an emerging trend in workplace education. For example, Action Learning, "a group effort that involves solving real problems and implementing systems-wide solutions while at the same time focusing on the learning acquired," is gaining use in such organizations as Whirlpool, GE, Anderson Consulting, British Airways, and Motorola.[5] The CLCI's problem-posing curriculum is also similar to the "field studies" used to teach the SCANS Competencies[6] in some high schools and community colleges.[7]

In the problem-posing curriculum, problems may be identified in a preliminary way through the WNA and then further clarified by workers in the instructional setting, or they may be identified entirely through the WNA or by workers in the instructional setting. As

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[5] Michael Marquardt, "Action learning in the classroom," *Performance in Practice*, ASTD Newsletter, Summer 1997, p. 4.

[6] The list of skills and competencies viewed as necessary for successful work performance, by the Secretary's Commission on Necessary Competencies, U.S. Department of Labor.

[7] Posted on the National Institute For Literacy-Workplace Internet Listserve, 11/3/96.

part of the curriculum process, workers investigate the problem and potential solutions, test some of them, and communicate with management about them. This process involves a challenge to workers' reading, writing, computation, speaking, listening, observational, problem-solving, and teamwork skills. As inadequacies in these skill areas appear in the context of solving the problem, the learner is led to instruction in the needed areas. The solutions are offered to management with the hope that some direct application to the workplace will be made, and, in the best possible case, significant return on investment will result.

Exactly what constitutes a "problem" for this model -- whether it is directly tied to the production process, to the big picture of how the business runs, or something else -- has been a source of lively discussion within the project. The understanding that evolved among the CPT members is that a "problem" may be one of three types:

A. Specifically production-related -- for example, how can an old conveyor system produce less waste and lower injury rates?

B. A broader issue related to the workplace -- for example, how can workers learn more about their benefits and retirement options?, or

C. An unsatisfactory situation whose improvement bears directly on improvement in the workplace -- for example, better knowledge of and skill with SPC on the new machines can improve production on those machines or in that department.

The problem-posing model should be considered a success in that most sites developed curricula out of worker-generated operations problems, saw them through to closure in proposed solutions, and obtained at least an open-minded response to their communications with management. In more than half the cases, solutions were implemented fully or with modification.

Among the seven projects, six conducted classes in which workers identified a problem on which to work.[8] These problems specified a workplace "problem" that could be considered to have a reasonably manageable solution in an identifiable time frame. Examples include:

- "hot job" buildups and how to eliminate or reduce them; with additional subproblems: a) mapping the total workflow process; b) developing a Process Improvement Form; and c) developing recommendations for worker cross-training
- inadequate understanding of and participation in company retirement programs

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[8] In the seventh site, two groups worked on production-related problems, but the managers, not the participants, identified these problems.

- shift change communications inadequacies, inadequacies in cross-training, product waste resulting from improper conveyance equipment and its alignment with production machinery
- workers' inability to record and accurately log paperwork and paperflow processes, a problem that requires direct improvement in written communications skills in a specific workplace context.

There were curriculum units that did not fit into the ideal model described by the majority of sites' experiences above. These are considered variations of the problem-posing model to fit appropriate company circumstances. For example, one site did not use a specific problematic situation in the workplace as its curriculum core. It developed its topic for training -- SPC with problem-solving applications -- out of a company/union statement of what was needed for a specific work unit at the time. It appears to have influenced substantial changes in the workplace (by yielding over 400 percent decrease in reject rates and over 500 percent increase in scrap cost savings compared to its control measures) in addition to increases reported in employee basic skills' learning. Another site, as a result of its WNA, identified one of the broadest workplace problems among all sites: inadequate communications between workers and supervisors. It used more specific parts of that problem area as the impetus for its classes in basic communications skills. Its influence on the workplace has not yet been assessed. Both of these examples indicate ways in which the problem-posing model can be adapted to take account of the total corporate cultures of companies and serve the needs therein.

The problem posing curriculum's strengths:

- A high value is generally placed on this type of learning activity by workers, managers, educators and union representatives because it is directly related to workplace improvement. There is also a high degree of worker (and sometimes management) interest and involvement in the actual instruction. Similarly, the potential for bottom-line outcomes that can come from this kind of curriculum is enticing to all stakeholders.
- The problem posing curriculum is consistent with the team and problem-solving emphases of high performance work organizations. It provides a built-in mechanism for workers to interact with management on "real" issues.
- The problem posing curriculum incorporates many SCANS skills.

Difficulties with problem posing curriculum:

- Some workers, supervisors, and Human Resources personnel express impatience with workers being asked what problems they wanted to work on in class. They either want

workers to be told what to work on, to identify the problems more quickly, or to work toward solutions more quickly.

- Some educators feel that a focus on "problems" -- no matter how loosely they are defined -- unnaturally restrict the options for instruction.
- The problem posing curriculum requires management's commitment and involvement in order to achieve maximum outcomes. Sometimes management did not follow through on the solutions developed and presented to them.

Adjustments to the problem solving curriculum component:

- The definition of "problem" was broadened to include: (1) it is directly production related; (2) it addresses a broad workplace concern; or (3) it improves skills that will likely aid production.
- Some sites, after having followed what might be considered ideal problem-posing curricula, began to question whether the model adequately addressed the conventional basic skills (the 3 Rs) in which the participants needed help. Some responded by providing more conventional basic skills instruction for those participants who saw the need for such help themselves. This awareness may lead to a valuable feature of the problem-posing curriculum – namely, such curriculum can provide a powerful foundation to identify the "basic skills" needs, instigate worker self-interest and motivation to fill those needs through further education, and solidify a workplace context for which skills to teach and how they will fit into worker and workplace improvement.
- If teachers or program coordinators yield to managers' or others' impatience with having workers identify the problems they want to work on, they might short-circuit the problem-solving process, reduce participant ownership of the problem, and thus minimize the learning involved in trying to solve the problems. On the other hand, these are some of the adaptations that may need to be made with the model to integrate it with particular workplace cultures.
- The problem posing curriculum requires teachers to assume non-conventional roles. It took some time and extra support for some teachers to follow this approach comfortably. Some instructors buy into the approach and some do not. A program needs to select and orient instructors carefully.
- Management involvement needs to be ongoing and consistent. It becomes clear after one or two groups develop solutions independent of management that management needs to be involved in order to integrate worker-generated solutions into work processes.

- As "problems" increasingly drive "instruction," and solutions are meant to be applied in real work situations, instruction in some programs moves out of the classroom and onto the floor. This is another element to which instructors and all stakeholders must adjust. In general, stakeholders should expect uncertainty and creative potential as "curriculum" interacts more with the floor and new roles are defined for all.

Portfolio Assessment

The CLCI model includes the use of portfolio assessment. Given the worker-generated, problem-focused nature of the curriculum, it seemed appropriate to use an assessment method that would encourage complete and interactive (between workers and instructors) documentation of what was accomplished in a class. The interactive quality of portfolio assessment is aligned with problem-posing instruction because, as workers become more engaged in the learning process through identifying what they need to learn to solve a problem, they also become more engaged in assessing their own progress toward solving that problem. Portfolio assessment is also especially suited to the whole-language approach set out in the CLCI proposal. Individual portfolios may include documentation of more traditional basic skills gains, but they may also contain documentation of problems, activities related to investigating them, solutions, management responses, applications, and attainment of SCANS skills and competencies. The model has expanded to include use of class portfolios as well as individual portfolios.

Student portfolio assessment activities were halting in their development. Portfolios became mostly a repository of individual or class work, not clearly indicating progress along defined criteria. Student portfolios were used at the full individual student level in only two sites. Five of the seven sites reported having some type of individual student portfolios for at least some, though never all, of their classes. They were used in partial form at the class level in four sites. Only one site, however, demonstrated all the qualities of portfolio assessment originally outlined by the project's CPT: states student learning goals, demonstrates personal performance of students, is a collaborative effort between teacher and student, is learner-centered in contents and processes, and is used to plan future learning activities.

Three factors made it difficult for sites to use portfolio assessment as intended. First, CLCI's emphasis on problem-solving process in a team setting made the identification and assessment of individuals' skills and knowledge of the course content difficult. Individuals make different kinds of contributions to the team process in identifying and solving group problems. In addition, the tasks that individuals will perform

during a course cannot often be pre-specified. Within the general parameters of the problem-solving process, the next activity depends on the prior ones.

Second, the courses were relatively short-term (maximum of 10 weeks at 3 hours/week). Teacher preparation and facilitation of the group were so time-consuming that little time was left for individual portfolio planning, assessments, and feedback into individual instructional plans, especially since individuals' skill development was not the primary focus in most courses. For the classes which taught customized workplace basic skills (for example, one site's workplace reading and math), individual portfolio assessment was used more fully.

Third, during the early stages of the CLCI, site personnel discovered that most instructors had too superficial a knowledge of portfolio assessment to apply it to adults in the workplace settings. Training resources were, unfortunately, too limited to allow this project to obtain necessary training. Even those staff who had training available to them from other sources, however, found the application of portfolio assessment concepts to the team-based problem-posing curriculum difficult or impossible.

In one site, portfolio assessment was used in an innovative way that joined instruction and assessment more completely than in other programs. Conditions in the program turned an assessment of operators' skills into a learning opportunity. Workers were asked to record information on paperwork/paperflow forms with such accuracy that it would help others in the plant to solve problems and troubleshoot issues. The EPT developed a criterion sheet that described characteristics of properly completed paperwork. The instructor showed the model portfolio with criterion sheets to workers and asked them to collect samples of their own paperwork over a period of several weeks. Over a two-week period, workers gathered samples of their work in working portfolios. The instructor and a management representative reviewed each portfolio to determine how the workers performed each required task. When workers returned their portfolios, the EPT quickly noted the problems that were there. EPT members were able to respond to those problems quickly with targeted, customized one-on-one instruction carried out in individual conferences. Typically, workers would be shown a better way of carrying out a paperwork task; they would go out and try it on the floor; and then they would return to show the instructor how they did and to get additional guidance. The portfolio was thus seen as a focal point for learning activities, rather than merely as an "assessment" tool tacked on to instruction. Learners used materials from their portfolios, revised them, added new ones, and thereby documented what they were learning as they proceeded.

Portfolio assessment's strengths:

- All the advantages of portfolio assessment for adult learners in a non-workplace setting are potentially available in the workplace setting. These include: workers help to establish the standards by which they will be evaluated; assessment is directly linked to what is taught and learned; increments in learning and skill acquisition become visible over time; portfolios may be used to demonstrate learning to an outside audience, etc.
- Portfolio assessment is appropriate for an emerging curriculum where standards are just being developed.
- Portfolio assessment can be an instructional tool, as described above.
- This process often parallels the workers' corporate personnel evaluation system, such as Employee Development Plans with employee specification of goals, timelines, evidence, and progress monitoring.

Difficulties with portfolio assessment:

- Many teachers are not adequately trained or do not have the skills to conduct portfolio assessment well. Portfolio assessment requires teachers to acquire some new technical knowledge and new roles as coach and mentor to students who are more in charge of their learning and assessment.
- There was some lack of clarity about the purpose and use of portfolio assessment in the CLCI. Who were the audiences for the portfolios? and what was important to document?, were questions never clearly resolved at most sites.
- Portfolio assessment was developed as an individual assessment process. It works best for instruction that takes place over time so that real progress can be documented. As described, many CLCI classes were team focused and relatively short in duration.

Adjustments to the portfolio assessment component:

- Portfolio assessment is a newly developing area within workplace education, especially for a project like the CLCI with a problem-posing curriculum. While it is possible and desirable to create class or team portfolios, classes with a team focus demand creative application from the teacher. Short courses may require some, perhaps as yet unidentified, creative approaches to using portfolio assessments. The CLCI and the field in general need more reflective implementation in order to develop useful methods for individual or group progress assessment.

Evaluation Process

The CLCI conducts two levels of evaluation. The first level is carried out by the EPTs based on program-generated goals. This level of evaluation is meant to be customized to each individual site. In a study of the "best training evaluation practices" in companies, all the best practices were focused on internal program development uses and were "tailored to that particular organization, representing its culture and needs."[9] With instruction and technical assistance from the external evaluators, EPTs conduct internal evaluations using a guide called the "Site Evaluation Portfolio" (site portfolio). The site portfolio is another use of the portfolio assessment concept to help site staff keep track of their evaluation activities and results. Site portfolios are supposed to be submitted three times per year by the sites to the external evaluators for use in tracking the processes, outcomes, and context information from each site and to pinpoint where the evaluators might provide assistance to the site to improve its evaluation. Formal feedback about areas for evaluation improvements, if appropriate, is provided to each site after submission and review of the site portfolio.

The external evaluators also use the information contained in the site portfolios to supplement their own data collection for the second level of evaluation -- the more traditional, goal-based external evaluation, which is required by NWLP funding. Emphasis on use of evaluation results by the CPT to inform continuous improvements in the program is in line with the high-productivity context of CLCI. Local sites, either directly or through the external evaluators' reports, and the evaluators themselves report often to the CPT on the evaluation process and results.

This project's use of the site evaluation portfolio process does not seem to have been done before. Thus, the specification of what could realistically be entered into the portfolios evolved during the project. Four of the seven sites provided systematic information in their site evaluation portfolios, following the site portfolio guidelines. Some outcome information in the areas of SCANS competencies, other worker and workplace impacts, and possibly business/union commitment to worker education is found in those four sites' portfolios. Only one site followed the complete process from the outset as outlined by the evaluators. Three others developed their site portfolios during the third year of the project to include most of the desired information and format to a point that was reasonably organized to meet the site portfolio's purposes.

Why the site portfolio fell short of expectations may be partially explained by the following. Most of the education partners came into the CLCI with a substantial amount

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[9] Nancy Dixon, "New routes to evaluation," *Training and Development*, May 1996, p.85.

of experience in more conventional roles of teaching basic skills classes in worksites. As the CLCI model emerged over the first several months, they had to take on new roles, including leading an extensive WNA and integrating their programs' goals and activities with the company cultures. To complicate matters, the model was emerging with practice, and thus was often unclear at any one stage. Demands for program development received priority attention to the virtual exclusion of evaluation activities, as is natural for educators. In a subsequent round of such a project, the program can be more prescriptive about evaluation earlier on, still encouraging customization among sites.

Evaluation of CLCI has been fairly difficult, both for the EPTs' internal evaluations and the external evaluation. A large part of the problem has been the developmental nature of the CLCI. The model was meant to develop and change as it went on; its initial goals were at best implicit; and it was designed to be decentralized, that is to have a general common direction and have that direction customized in each of the seven sites. Moreover, because of the fluid nature of the governing process, formalized in the CPT, the common direction would be allowed to change in response to how individual sites developed their adaptations. Thus, evaluators could not be very prescriptive to the sites about what the evaluation criteria were. Instead, the external evaluators would work with the sites to help shape an evaluation procedure along with the rest of the model's development and testing. More standard activities for use at all sites emerged during Year 3. Specifically, the evaluators focused on having site personnel collect data according to the Kirkpatrick model[10] and use "problem-tracking" charts,[11] and have the EPTs continue to monitor the sites' indicators as signs of goal attainment and document context information. Overall, however, there is a lack of standards for evaluating a program such as CLCI. Progress toward goals can be measured, but no standards exist to determine what amount of progress is "good enough?"

Strengths of the site portfolio evaluation process:

- Internal evaluation processes are customized to each site, encouraging each EPT to think through its own goals and indicators and to choose data gathering methods that are appropriate for the site.
- At the same time, the site portfolio process is standard enough that it allows some degree of synthesis of data across sites. This is an important consideration in a multi-site project where external evaluators rely on data gathered at the site level.

[10] Described in more detail and referenced in Volume II.
[11] Included in the Appendix to Volume II.

- The site portfolio is a good internal management tool. It builds capacity for informed planning and utilization-focused evaluation -- two essential program components in an era of increasing accountability to public and private funders of education projects. Furthermore, the site portfolio is consistent with high performance practice.
- The site portfolio is consistent in format with the portfolio assessment procedures the CLCI model advocates for use with students.

Difficulties with the site portfolio evaluation process:

- Despite theoretical agreement on the need for good evaluation, there is a lack of priority attention to and resources for formal evaluation by site staff.
- Companies are often not interested in "bottom line" outcomes to justify their programs, so educators are not encouraged by managers to formally evaluate.

Adjustments to the site portfolio evaluation process:

- The common criteria needed to integrate site and cross-site evaluation purposes were reworked to incorporate more explicit attention to the Kirkpatrick model and the "problem-tracking" charts, as discussed above. This revision paralleled the evolution of the CLCI's curriculum orientation and other components of the model.
- Instructors do not generally have a natural affinity or background for formal evaluation, thus they do not perceive these activities as key parts of their roles. Structuring their roles to do evaluation helps somewhat.
- Discrete evaluation tasks and clear guidelines for evaluation activities show the usefulness of evaluation for internal management and program development purposes. Instructional tracking charts and referencing the Kirkpatrick model helped to demonstrate this usefulness.
- Evaluation's greater usefulness in the CLCI may have been to focus the EPTs on local and CLCI goals and activities, and to maintain that focus over time. It's lesser utility was the linear progression of feedback.
- No standards exist for workplace education programs, and help is needed to develop some.

Outcomes

The general categories of outcomes of interest to the CLCI are those on the worker, the workplace, and the business/union commitment to workplace education. Specific outcomes within any category are not specified at the statewide level; rather, suggestions are provided. For worker outcomes, SCANS skills and competencies and

other outcomes such as self-confidence or attitudinal changes are suggested. For workplace outcomes, such options as scrap rates, cycle times, ROI, improved high-performance characteristics, and other changes in work processes are included. For commitment outcomes, institutionalization of some form of the program at the business is the criterion. Choices of specific outcomes within each category are up to the local EPTs as part of their goal-setting process. Outcomes are understood to be the result of both the trajectory of CLCI model components and the interactions of those components within individual site contexts.

Much of the extant CLCI outcome data comes from the collection of information by the external evaluators from the site visits and through other phone discussions and written correspondence. CLCI has had an impact on the participating workers, workplaces, and business and union commitment to workplace education. The evidence is mostly anecdotal, though some comes from careful assessments of participant learning in classes and from documented workplace impacts. The worker outcomes are most often in two areas: communications skills (listening, speaking and writing) and problem-solving skills. Additional areas mentioned are teamwork and group skills, and attitudes or self-confidence. Some of the workplace outcomes further reinforce the communications and problem-solving skills of individual workers in designating the specific uses of those communications and problem-solving skills.

Other workplace outcomes are less directly tied to the content of the courses, but involve examination of "hard" outcomes related to production. For example, at one site, one team was trained in SPC and applied problem-solving for a new production line. For the first six months after the training, which was concurrent with the start-up of the new line, they tracked their scrap rates and those of a comparison group on a similar line which had received only OJT. The production line involved in the grant's training program had 461 percent fewer rejects than did the comparison group over that period. No other changes or circumstances are known to have influenced this effect[12].

In another case, the site's results indicated a marked trend of decreased thru-put (or cycle time) in workdays over a given period, with the greatest decrease occurring after the period when the company initially implemented "solutions" from the problem-solving classes. Examination of the customer shipments for that same period revealed the same trend – that is, the number of early or on-time customer shipments increased substantially after the implementation of CLCI's classes' "solutions."

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[12] The Hawthorne Effect, the positive influence because this was a special set of circumstances, may, however, have influenced the outcomes.

Although assessment of return on investment (ROI) was one of the underlying principles of the grant proposal, questions about the value of this measure emerged during the first year. Since assessing ROI would have required the companies to supply information that is sometimes not easily accessed and is proprietary, the evaluators needed the companies' high level of interest to follow through with the ROI assessment. Three of the companies indicated that they were not interested in ROI, that they valued education in itself for their workers and did not need the justification of a formal cost payback analysis. The other companies were interested, generally to help bolster the priority of company investment in workplace education in the rapid decisions that are sometimes made while restructuring and downsizing.

Business or union commitment to workplace education is perhaps the most difficult of all the indicators to assess with any precision. Six of the seven sites, however, have said that they will continue their education programs in some fashion. They all had provided education and training programs before the CLCI and nothing in their CLCI experience will stop them from continuing. Whether they continue to convene an EPT, use WNAs, focus curriculum on problem solving, and apply worker-generated solutions remains to be seen.

Difficulties with determining CLCI outcomes:

- There was wide of variation in the extent to which site portfolios formally documented worker or workplace outcomes. There is formal data for some sites and little or none for others.
- Workers' skill improvements were not well documented but likely occurred.
- Business and union commitments to education were generally high before the CLCI began and remained high through the end of the project. This makes assessing change difficult. Commitment also seems to vary depending on production demands and market conditions at the time.

Adjustments to expectations for outcome data:

- Expectations for "hard" data were reduced among CPT members over time. Hard data were made available only by those sites for whom it was important. Anecdotal evidence predominates.
- Expectations for ROI data were significantly reduced. Only three companies expressed interest in ROI data. None had resources for or familiarity with conducting such an analysis.

The Central Planning Team

As mentioned at the outset, the seven sites operate their programs under the guidance and coordination of the CPT which is composed of representatives of each site and four central team members, one from the NYSED, one outside curriculum consultant, and two external planning and evaluation consultants. Democratic representation of local sites' views at the CPT level is intended to insure that the project will develop dynamically, with imaginative discussion of what it can accomplish, and with adequate structure to govern a multi-site demonstration project where sharing information among sites is critical. The CPT models high performance structure at the project level, just as the EPT models it at the site level. The CPT solves problems as needed, responds to site needs for governance, and identifies what it needs to do next to fulfill both grant requirements and its own expectations of itself.

The CPT met fairly regularly -- bi-monthly at the beginning of the grant period and then approximately quarterly thereafter. In order to function as a high performance work organization, the group articulated a complete set of goals and indicators that became the framework for project planning, site evaluation, and for CPT self evaluation. In its meeting structure it attempted to insure that information that was gathered and shared at CPT meetings found its way to the local sites and that local site issues were communicated back to the CPT. The CPT worked hard to insure that there was educator, business and labor representation at each meeting. Minutes were distributed more or less regularly to insure that all interested persons were informed about CPT activities. Facilitation was rotated among members.

CPT members specifically indicated that the greatest value in CPT participation was in such "personal" features as:

- serves a good morale function, binds the people together
- provides information, but the support is most important; get to know the other project people and feel comfortable calling on anyone
- gives a broader understanding of the total context of the project than that obtained from the technical details alone
- the value is in being a participant -- learn from others, have the experience of being part of a governing team, get a better sense of this "new view" of workplace education, get a sense of being on the right track in the program, have reassurance that

they're alone in the things they've been struggling with, know that there's a network and support group in which to participate.

The CPT learned that it was difficult to live up its expectations of itself as a high performance work organization. It was difficult to get regular representation from business and labor to the meetings. It was even difficult for a period of time to insure educator representation from each site. Keeping the CPT's information systems flowing meant that someone had to take responsibility for setting an agenda and following up with minutes -- tasks that sometimes waited until the last minute. While meetings were generally energetic and productive for the majority of the grant period, it was difficult toward the end of the project to maintain momentum between meetings. The group may not have dealt with leadership structures adequately enough to maintain high levels of interest in rotating leadership among members.

The CPT is important for understanding how the CLCI functioned. It also has implications for other multi-site projects. The advantages of shared coordination and systematic knowledge-sharing suggest that stand-alone workplace education programs would benefit from joining with other programs in such a cross-site association.

Strengths of the CPT:

- The CPT motivates and excites members to create a structure that will serve the needs of an evolving project.
- It helps sites to feel they are part of larger whole to which they can take problems and from which they can receive support. Sites share information and develop practices in a collaborative spirit.
- The CPT helps sites to stay focused on tasks while maintaining the original vision of the project.
- The group can orient new people and new sites as they join the project after the initial start-up.

Difficulties of the CPT:

- Not all members necessarily assume leadership responsibilities.
- Administrative and logistical systems were not developed fully.
- In this multi-site project in a large state, the time and travel expense to and from CPT meetings was a burden for some members.
- Some business or union representatives do not consider participation in the CPT to be value-added.

Adjustments to the CPT:

- The CPT started "late" in response to a specific planning need, not at the beginning of the project.
- The different roles and functions needed to keep the CPT functioning emerged over time. They were not obvious to members at the start nor were they sufficiently reviewed.

III. Key Lessons from the Overall CLCI Model

A major conclusion drawn from the CLCI model is that an education program can help to leverage organizational change as it addresses some worker basic skills needs. Significant workplace results are demonstrated within the model development period. There are many examples of results offered throughout Volume II and earlier in this volume. One particularly poignant example is from a site in which a portion of the plant that is typically neglected and identifies itself as marginal-- the 3rd shift -- became much more integrated into the company life as a result of a communications course conducted at night by an instructor. When engineers and designers spent some time with 3rd shift operators, the operators began to feel that they counted -- as people and as members of their work community. These operators now participate in design decisions, something they could not believe the company would allow before the program. There is also evidence that the results of one small course may impact a company over time. More than two years after its conclusion, results of the first communications course in this site are still evident.

It would be interesting to see how many more solutions workers might transform into greater ease or efficiency of work, or savings for the company, or other benefit for themselves or the company if the problem-posing project continued. One wonders how creative workers might become in some sites if given continued support to solve problems and improve themselves and their conditions at work.

The CLCI model did not generally address the conventional basic skills to a significant degree, although more sites provided such instruction later in the three-year period. As a result no conclusions can be drawn about how the model would work in companies where conventional basic skills education is a more urgent need than it was in these. Some of this project's workplaces had workers with very low basic skills, and some parts of the model worked at those sites. These sites did not, however, address the conventional basic skills as their primary focus.

The major learnings of the CLCI model overall are divided into "strengths" and "difficulties," as in prior sections on the model's components. "Adjustments" are left to readers who wish to take the learnings of this project and apply them to their own organizations and programs.

Strengths

- The CLCI model provides a dynamic structure to two different cultures -- business and education -- through which they can accomplish something that workers, companies, and labor organizations need: improvement of skills and work conditions. The EPT and WNA especially provide forums in which the two cultures can communicate safely and effectively and, presumably, reach agreement about how to run a good program.
- The EPT is an essential component for any workplace education program that is to be integrated with other parts of the company's system or culture, regardless of whether the program implements other parts of the model or not. No participating site representative could imagine running a program without the EPT "crucible" in which program stakeholders meld their goals, even if the program does not fully carry out the other CLCI functions.
- The WNA sets the stage for a strong, realistic program that is well integrated into company culture. It helps mitigate against promising too much with in a program, grounds what educators offer directly in what workers and managers and union representatives have identified as their most pressing needs, and facilitates educators' entry into workplace culture.
- Problem-posing curriculum can be interpreted in many different ways -- from a broad and elusive problem like poor communications between managers and workers to something as specific as improving SPC skills. What is important is not how large or small the problem is but how important workers think it is and how ready management is to accept solutions from workers. There is a trajectory from the EPT to the WNA to problem posing curriculum that brings closure to a problem and, potentially, real workplace application. That trajectory coupled with the interaction of elements in the model has a value that is greater than any one part alone. However, any part or parts of the model can be used to achieve good results. For example, a WNA might be conducted by an EPT that would lead to learning activities that are not problem/solution/application oriented.
- The CPT is important for a multi-site project. It is a forum in which valuable information is shared, new ideas are generated, and members are motivated by the psychological support of belonging to a larger group effort with common goals. Further, the CPT models the high-performance organization for the benefit of participating sites, to the extent that members take the initiative to conduct the group as a high-performance one.

- The CLCI model is open. It encourages experimentation with new forms of instructional delivery, especially those that break down the distinction between work, learning, and assessment.

Difficulties:

- Some personnel, especially managers, are critical of the components that are not seen as "value-added." (For example, an EPT, WNA, or CPT.) Some personnel at management or floor levels need to go through the experience of a participatory, problem-posing instructional program before recognizing its value. It is not always easy to integrate a CLCI model with company culture if educators are more advanced in participatory, high performance practice. When educators drive the model, companies can feel it is an intrusion.
- It is helpful if personal incentives for workers are evident, especially when the program is not delivered on company time. Otherwise the model can be interpreted as benefiting the company through applied problem solving, without benefiting workers.
- Increased worker skills can lead to new types of interactions between floor workers and engineers and managers, with new expectations by floor workers for participatory responses. If managers are unprepared for new behaviors, unexpected friction may ensue.
- Some educators think that a problem posing curriculum is limiting. A WNA may lead to a variety of learning activities that are not necessarily problems and instructional staff should remain open to them, even if they do not fit the definition of a "problem." The model focuses on "problems" to insure that workers have real opportunities to apply new learning on the job, not to limit instructional options.
- There are limits to the technical skills that a traditionally trained adult education teacher will be able to teach. Adult educators know how to develop contextual curriculum and how to solve problems, but they are not machinists or quality process experts. They should not be expected to take the place of in-house trainers.
- The WNA might raise issues that educators cannot easily address. If educators are not "insiders" then they can work to raise the consciousness of "insiders" about the need to address important issues. Educators need to learn to assess the limits of their roles and responsibilities. In a related vein, managers and supervisors are often caught in a tide of organizational change and do not always move easily with those changes. It may be difficult to apply even simple worker generated solutions to curriculum "problems" in workplaces where managers and supervisors are resistant to or unprepared for change.

Summary

This project began, in the funding proposal and at the initial orientation workshops, with a set of discrete assumptions or principles that it would try to implement. These, along with the participating staff and companies, were the unassembled building blocks for the project. Through the good thinking and experiences of the staff, interaction with and information from outside "experts," and continued reflective experimentation and practice, the building blocks were assembled into a dynamic, integrated model. This model is useful for those workplace education programs that attempt to integrate worker education with the total corporate culture, as promoted by Senge's "Fifth Discipline" for learning organizations.[13] The CLCI model is also useful in companies that have a belief in, or are at least open to, the practice of worker participatory approaches and empowerment, or that have a structure that is consistent with high-performance corporate development. Those who worked in this project have contributed to the development of this model through working in and with such organizations. The hope is that others will borrow, adapt and refine this project's findings for the further benefit of workplace educators and workers and their companies.

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[13] Peter Senge, *The fifth discipline: the art & practice of the learning organization*.. New York: Doubleday, 1990.

APPENDIX

Original Proposal Assumptions

- curriculum development based on an organizational needs analysis
- a problem-posing curriculum focusing on actual workplace situations
- whole language instruction
- writing as a process
- metacognitive skill development
- integration of Secretary's Commission on Achieving Necessary Skills (SCANS) competencies and foundation skills
- portfolio assessment
- assured transfer of skill development from classroom to workplace
- a study to determine the feasibility of infusing technology in these promising practices
- a "pay for knowledge" worker incentive policy
- an evaluation design to measure return on investment
- integration of site internal and project-wide external planning and evaluation processes.

Statewide Goals

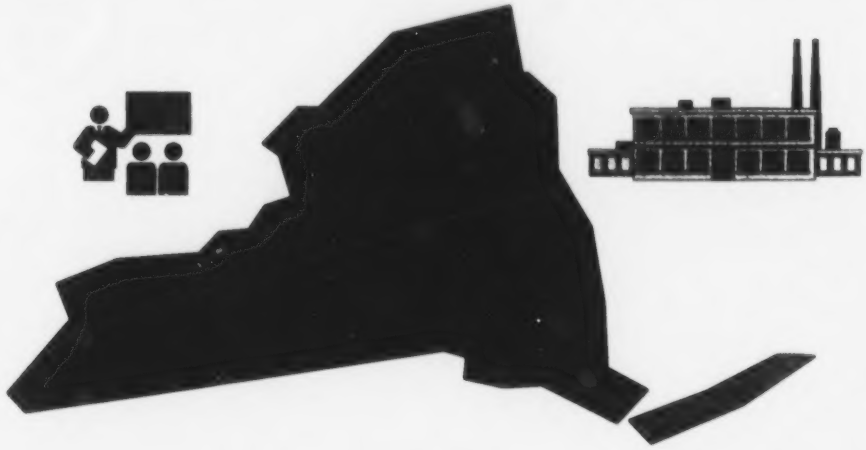
1. Provide a continuous improvement, customer-driven structure to support EPTs in attaining their goals.

2. Develop and evaluate/test the Collaborative Learning for Continuous Improvement model of workplace education that integrates a workplace needs analysis (WNA), stakeholder planning and evaluation process, problem-posing curriculum, and portfolio assessment in ways that are appropriate for each site.

   A. To integrate the education program within the broader workplace culture by conducting and utilizing the results of a WNA;
   B. To guide project planning, implementation, and evaluation at the local site level through a stakeholder-based team process;
   C. To develop a curriculum & instructional model which incorporates a problem-posing framework and portfolio assessment.

3. Demonstrate results of the CLCI model on:
   A. workers (SCANS competencies and other benefits, e.g., improved self-confidence)
   B. the workplace (including ROI and other impacts, e.g., improved high-performance characteristics)
   business/union commitment to worker education.

4. Promote continuation of the project at existing sites and expand to new sites in NY State.



Collaborative Learning for Continuous Improvement

Evaluation Final Report

Volume IV: Site Portrayals

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New York State Education Department

November 1997

PREFACE and ACKNOWLEDGMENTS

The Collaborative Learning for Continuous Improvement (CLCI) project was conducted under a grant from the U.S. Department of Education's National Workplace Literacy Program to the New York State Education Department from November 1994 through October 1997. The grant was to provide workplace basic skills education for employees in seven manufacturing companies across the state in partnership with five education agencies.

This is one of four volumes of an evaluation report for the project. **Volume I:** ***Executive Summary*** provides an overview of the evaluation results. **Volume II:** ***Program Goals and Accomplishments***, includes a presentation and analysis of findings about the extent to which the project accomplished each goal. There the outcomes from individual sites are detailed and an attempt is made to synthesize these outcomes across sites to present an overall picture of statewide accomplishments. **Volume III:** ***The CLCI Model: Vision and Realization***, describes the original vision of the model and analyzes its strengths, difficulties and the adjustments made to the vision as the model was implemented over the 3-year period. Volume III concludes with a discussion of what the project learned about workplace education through the experience, learnings that may be helpful for those planning, developing, or thinking further about workplace education. **Volume IV:** ***Site Portrayals***, provides a detailed picture of each site as a whole, its context, how it implemented the model, what it achieved, and what lessons might be learned from the experiences at that site. This volume is intended to give readers a grounded portrayal of the life of CLCI in its real settings, and perhaps to afford readers the opportunity to form their own sense of how the model is differently implemented in various contexts.

The work of the CLCI project involved the continuous efforts over a 3-year period of several individuals who participated regularly in the project's Central Planning Team, most of them in addition to their work at local sites. These included:

- Bob Knower of the New York State Education Department
- Paul Jurmo of Learning Partnerships in New Jersey
- Mike Armstrong and Margaret Shirk of Hudson Valley Community College
- Paula Hayes of the Onandaga-Cortland-Madison BOCES
- Karl Kania and Tom Wager of the Rochester City Schools Family Learning Center
- Bev Zier and Diane Spang of the Wayne-Finger Lakes BOCES
- Stan Swider of the Schuyler-Chemung-Tioga BOCES.

Others made significant contributions during their involvement in limited parts of the project, namely:

- Judy Lees of Hudson Valley Community College
- Sid Mann and Fran Simone of the Schuyler-Chemung-Tioga BOCES
- Chris Schwenker, Sheryl Grana, Joe Horton, Tricia Lum, Andy Mendola, Traci Panaro and Gina Porter of the Rochester City Schools Family Learning Center
- Sue Follinsbee of ABC Canada

- Ed Cohen-Rosenthal of the Cornell University School of Industrial and Labor Relations.

Additionally, representatives of the business partners spent considerable time working with the education partners, adjusting the efforts at their companies to effect some mutual adaptation with the project, sharing their thinking about workplace education with us as evaluators, and sometimes participating in statewide activities, including the CPT. These include:

- Vince Partisano of Albany International Corporation, East Greenbush
- Linda Holland, Marv Meissner and Bonita Lindberg of Albany International, Homer
- Al Zwack and Colleen Hyatt of Albany International, Menands
- Patti Campbell and Bob Trouskie of UAW Local 1097 at Delphi Energy Systems, Rochester
- Cynthia Schwab of EGG Wright Components, Phelps
- Mike Werner of Elmira Stamping, Elmira
- Joel Cummings, Maryann Lesnieski, Donita Mayes, Christie Nunn and Shyrl Orrego-Scalice of Eastman Kodak Corporation, Rochester.

Making a different kind of contribution was Gordon Quimby, who provided editorial review to the nearly final version of these reports. His lack of involvement in workplace education was particularly valuable in translating much of the shorthand terminology we've all come to use without thinking about who outside our circles understands it. We hope that we took his suggestions often enough and used them well.

We appreciate the efforts of all of the people above and enjoyed the opportunity to work with them during the project. They helped make the work most stimulating and enjoyable. In addition to the thinking they did to help develop and implement the project, their comments and questions helped us stimulate and clarify our own thinking. Thus, they can be said to have contributed to many of the ideas in this series of reports. As the ones who put it together on paper, however, we take responsibility for any errors or misinterpretations herein.

Don Cichon
Laura Sperazi

CONTENTS

Introduction

Portrayals:

Albany International Corporation, East Greenbush and Hudson Valley Community College

Albany International Corporation, Homer and Onandaga-Cortland-Madison Board Of Cooperative Educational Services (BOCES)

Albany International Corporation, Menands and Hudson Valley Community College

Delphi Energy/UAW Local 1097 and Rochester City Schools

E.G.&G. Wright Components and Wayne-Finger Lakes Board Of Cooperative Educational Services (BOCES)

Eastman Kodak Corporation and Rochester City Schools

Introduction

The six Site Portrayals included in this volume are analytic descriptions of each site in the Collaborative Learning for Continuous Improvement (CLCI) project in New York State[1]. The common context of each is the set of statewide CLCI goals and the key elements of the CLCI model. Within that context, each site is considered as a unique project with its own "story." Each story or Portrayal includes the site's own context and scope, major activities, accomplishments (goal-related and unanticipated), implementation and adaptations of the CLCI model, major problems and solutions, and speculations about what can be generalized to the field of workplace basic education from the site's experiences.

The statewide project's goals are presented in brief form in the Preface of this volume and in detailed form in **Volume II: Program Goals and Accomplishments**. Each Portrayal follows a format that includes the CLCI Model's key elements. These elements are described in detail in both **Volume II** and **Volume III: The CLCI Model: Vision and Realization**, but are briefly described here for the reader unfamiliar with them.

- Educational Planning Team (EPT): the governing group for the project composed of all site-based stakeholders, including the site coordinator, teacher(s), and the business or union partner's employee and management representatives

- Workplace Needs Analysis (WNA): one of the first steps in the project's site activity; an assessment and analysis of the company's, or targeted business unit's, organizational needs and those that the education program might address

- Instruction: the delivery of instructional services, either in classes or alternative methods, ideally composed of two special elements for CLCI:

    - problem-posing curriculum, whereby the basic skills instruction centers around a learner-defined workplace problem, and

    - portfolio assessment, in which individual learners are full participants with the teacher in their evaluation through their maintenance of folders containing work samples and evaluation information, and the selection and analysis of appropriate

[1] Though seven sites participated in this project, only six Portrayals received company agreement for inclusion in this report.

folder items to represent their progress. (Some sites did not implement the portfolio assessment and thus have no results described for this element.)

- Results: CLCI intended to assess results in three areas: learnings by the participating workers, impacts on the workplace, and changes in the business/union commitment to workplace education

Each Site Case Portrayal concludes with a section entitled "Main Lessons Learned from (Site Name)." These sections offer some contribution to a general picture of what was learned about the CLCI model for the project as a whole across all sites. That more complete set of general reflections and analysis may be of interest to the broader field of workplace basic education and is the subject of **Volume III**. The interested reader is referred there.

Albany International/East Greenbush and Hudson Valley Community College

Overview

The Albany International (AI) manufacturing plant in East Greenbush, New York produces "clothing" for the paper making industry. "Clothing" is also called "felt," evoking an image of a sturdy fabric on which paper is rolled through huge industrial paper making machines. Felts are woven with plastic monofilaments -- threads -- manufactured in other Albany International plants. The East Greenbush plant specializes in the production of felts for the "pressing" section of paper making machines. East Greenbush is a small, new plant. It employs about 150 people and is only 12 years old. It is a jewel in the Albany International crown, featuring the latest in machine technologies and team-based organization.

The two educational goals that emerged from analysis of WNA data reflect a clear team-based, high performance philosophy. The goals were to:

1. Make learning a more productive and integrated process in all team relationships and organizational processes and frameworks; and
2. Make the development of the program responsive to the educational needs of the employees and organization, and their ongoing assessment of the program.

The WNA further identified the following skills that are needed to improve "the work of individuals and correspondingly the work of the organization as a whole:"

- communication skills
- math skills
- computer skills
- job specific skills - for particular job requirements and in relation to the larger context of the business framework of AI.

The first Collaborative Learning for Continuous Improvement (CLCI) course, which included several classes, at AI/East Greenbush focused on communication skills. The goal of the communications course was to develop the speaking, listening, writing and reading skills necessary for effective participation of workers in all aspects of work. Classes began at the beginning of the second year of the project and continued through the end of the second year. Twelve communications classes were conducted with a total of about 150 workers. Results of the communications course are complex. Using Kirkpatrick's levels of evaluation as a reference, results include: (1) workers liked the classes very much; (2) workers learned the skills that the course taught, but (3) application of skills at work has been spotty. This is alternately viewed as either the result of the

tension between the philosophy of worker participation and the opportunity workers actually have to participate fully in work processes, or as the reluctance of some workers to become fully involved in and responsible for their work. In either case (4) the effect of workers' learning and application of skills on the business has no way of being assessed at this point. There is a question about if and how management will follow-up on what the communications course initiated. (5) There is no interest in formal ROI data.

The second course, which also included several classes, focused on math skills. The goal of the math course was to develop math skills necessary for effective participation of workers in all aspects of work. Classes began about three months into the third year of the grant. The math course reached a total of about 140 workers. Using Kirkpatrick's levels of evaluation[1] as a reference, results include the following. (1) Workers liked the classes very much. (2) Workers learned the skills the course taught, including understanding of finance, money, value and future value and use of statistical analysis for Quality Assurance. (3) Application of skills at work has been visible to some extent through informal observation, including workers' use of calculators and conversions to metric measurements. Workers say that the greatest amount of application of skills has thus far been at home. (4) The effect of workers' learning and application of skills on the business has no way of being assessed at this point, although management is confident that benefits will become visible. (5) There is no interest in formal ROI data.

Together, the communications and math courses account for 4,326 hours of instruction to 150 workers for a total cost to the company of about $119,000.

Business Context

AI/East Greenbush is one of three Albany International plants involved in the CLCI. Despite being part of the Albany International Corporation, the plants operate separately and have distinct work cultures. AI/East Greenbush is a relatively new plant in the AI family -- only 12 years old in a company that is now 102. As a relative newcomer, the company seems to be less tied to traditional organization of work than the older plants like Homer or Menands. It embraces the philosophy and practice of high performance and has won the coveted Excelsior Award for excellence in manufacturing. Dr. Deming himself once visited the plant, an event that was seen as a kind of blessing but also a challenge. Like other AI plants, it is an independent business that needs to show a profit within the AI corporation as well as against its competitors outside of AI.

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[1] Donald Kirkpatrick, Evaluating training programs: the four levels. Alexandria VA: American Society for Training and Development and Barrett-Kohler, 1994.

Although it is interpreted in many different ways, the high performance workplace is generally characterized by support for worker involvement in job-related decision making, flattened management structures, teamwork, and a focus on quality. Market conditions in the paper machine clothing industry have been hostile in recent years. There have been price wars and general overcapacity in the industry. It is likely that the company is entering the second wave of a hostile market that could last for five years. These are unexpected events that drive management toward creating greater efficiency in all aspects of production. They want to continue to be the world's leader in paper machine clothing manufacture, for which the price may be a partial return to traditional modes of work.

Education and training are understood to be integral to continuous improvement of work processes. Managers are not particularly interested in calculating hard results of their investment in training. They trust that when workers are encouraged to learn what they need to learn to be both better workers and better human beings then results will appear -- perhaps years after the training was conducted. The plant offers many trainings. The CLCI program is one among many, although many of its features are unique. Workers in the plant generally have at least a high school education.

Business context and its specific relation to the content of the communications course

Understanding recent changes in business context at East Greenbush is key to understanding the content of the CLCI communications course, the problems which the coordinator/instructor has encountered in her classes, and the solutions she tried to implement.[2] There are two voices to be heard in a discussion of the business context and its relationship to the communications course: the voice of the workers and the voice of the managers. For the purposes of this portrayal, the voice of the workers is represented by the workers themselves in a focus group, and by the coordinator/instructor who has come to understand the workers' position very well. The Human Resource Manager represents the voice of management.

The East Greenbush plant was a model high performance workplace until shortly after the Project began. At that time, a new Plant Manager was hired. He is more traditionally production-minded than was the former Plant Manager. While some high performance philosophy is still applied, workers generally feel that there is a gap between what the managers say they want from workers -- responsible behavior and decision-making, clear communication, a manifest ethic of "total involvement" -- and the way that

[2] While the business context is generally relevant to the content of the math course, it did not affect the content of the math course to the same degree as it did the communications course.

the managers treat the workers. One could say that, from the workers' perspective, the plant philosophy is high performance but the practice is old-style hierarchy.

The Human Resources Manager explained that the plant was losing money under the pure high performance model in a hostile market and that the new Plant Manager was brought in to increase profit. The company is not interested in reverting to a purely hierarchical management model. However, from management's perspective, some workers still need to learn what responsible behavior in a workplace looks like. The Human Resources Manager said that about 20 percent of the workforce cannot self-direct. It seems that the plant still has a commitment to self-directed work teams and to teaching that 20% what genuine self-direction is. However, this commitment may not be apparent to some workers.

As described in more detail below, the WNA identified the need for better communication between workers and supervisors. The coordinator/instructor developed the communications course based on the discovery of this need. However, workers generally feel that their communication skills are good and have improved through the communications course. They believe that the problem rests primarily, though not exclusively, with supervisors whose communication skills are not very good. For example, workers in a focus group agreed that "supervisors do not listen well, they misinterpret. They say that they are listening -- the philosophy of participatory management -- but they do not behave accordingly."

Workers' belief that they did not have a communication skills problem created a hostile environment to teach in, especially because attendance in class was mandatory. Mandatory attendance made some workers perceive the classes as "one more thing that management wants us to do" when, it is implied, managers could learn from such a course themselves. The coordinator/instructor resolved these tensions as much as possible by focusing on communications problems in their most specific cases, using examples from the floor, trying to stay clear of broad-based organizational solutions but also being sympathetic with what the workers presented as their "real" problem and addressing some systems issues.

Some progress toward improved communication company-wide might come about if workers and supervisors can review case studies, analyze the different perspectives they bring to so-called "communications problems" and try to understand the other's point of view. This process is, in fact, already underway. Some workers also thought that a formal comparison of cases written by workers and supervisors might merit some additional class sessions. The Human Resources Manager suggested that this type of activity might take place in a regularly scheduled meeting, when workers and managers are already together.

It is possible that the communications course has given louder voice to the very problems that alerted management to the need for it. It is possible that the course has opened an opportunity to discuss the tensions inherent in promoting a high performance model at a deeper, more challenging level than is comfortable for some people but from which the company will inevitably benefit.

Educational Partner

The Office of Technical and Professional Training at Hudson Valley Community College (HVCC) has been providing workplace education services to businesses in greater Albany since 1984. The Director of the Office of Technical and Professional Training acts as off-site coordinator for the CLCI program at East Greenbush. Until February 1997, there was one other staff person for the CLCI program at East Greenbush who acted as both on-site coordinator and instructor for the communication skills course. Then another teacher was hired through the grant to teach math. All staff have a background in adult education. HVCC also administers the CLCI workplace education program at AI/Menands.

The Partnership

HVCC had not conducted a program at AI/East Greenbush before the CLCI grant was awarded but representatives of both organizations had talked about workplace literacy and had a proposal for a program on the table when the grant award was announced. There have been no notable difficulties in this partnership other than, perhaps, early on, a difference in philosophy about the need for plant-wide educational testing. HVCC dissuaded East Greenbush managers from investing in that activity. Their experience in other programs had taught them that testing serves little purpose other than to alienate workers from the educational process. It triggers memories of negative experiences at school and inhibits excitement about learning at work.

The EPT

The EPT is composed of the Human Resources Manager, the off-site coordinator from HVCC, the on-site coordinator/instructor, about 6 workers (including two team leaders), and a representative from the United Food and Commercial Workers Union which has only in the last year begun to gain a presence in the company. Union membership is now about 50 percent but the contract is binding for all workers. In the first grant year, the EPT met every six weeks.

There have been no regular EPT meetings since the beginning of the second year of the Project. The instructors, however, have regular contact with the Human Resources Manager and discuss the program with him. Once instruction for the communications course began, management felt that regular EPT meetings were not necessary. Management saw the EPT as a planning group, not a governing group. Even though the EPT has not met regularly, it is thought that the EPT raised awareness about what good workplace education looks like. The EPT and the integrated education program it developed challenged the "vitamin shot" version of education -- that, for example, a two-day long training program without the full participation of workers would have a substantial impact on the company. Some might say that the communications course was successful because it was not constantly scrutinized by an EPT, but the drawback is that the EPT did not function as a program guide.

The WNA

The off-site coordinator, the on-site coordinator/instructor, and the Human Resources Manager developed the WNA goal and then took it to the full EPT. EPT members reviewed the goal and approved it. The goal was to identify the training needs of floor workers and supervisors so that a responsive program could be developed. Individual and group interviews were used to collect data. The on-site coordinator/instructor interviewed a total of 84 employees, 27 salaried and 57 hourly. The on-site coordinator/instructor prepared a draft report of WNA results, which was edited by the off-site coordinator and the Human Resources Manager. Then they presented the results to the EPT. Results were presented as a series of conclusions with a request to the group to prioritize them.

WNA results reflect a high performance culture. Workers have, for example, a "strong desire to develop an understanding of the principles and knowledge that determine the processes and changes in their work, both at the level of their specific job titles and in the context of the company itself." WNA results highlight the need to understand the need for improved communication in terms of both skills and organizational relations. While "communication skills identified as speaking listening, reading, and writing ... form the backbone of the education program...repeatedly the need for systems to enable and facilitate communication has been asserted ...." In retrospect, reading the WNA report, the statement of need for both individual training and systems review borders on a plea: "We all need training in communication and how to make a consensus view... The need for a common language was noted consistently by managers and hourly workers alike and the

need to teach people how to talk to each other at all levels, between levels and between peers and individuals." The WNA identified a core need.

Instruction

Communications Course: *As* stated in the WNA, there was a strong desire throughout the plant to become a more cohesive high performance workplace, and communication skills were thought to be the best programmatic starting point. In order to insure that all workers were exposed to the ideas of the new program, management made participation in the communications course mandatory for salaried and hourly workers alike. However, they separated workers and managers in different classes. There were 12 communications "classes" in the communications "course." Each class had between 10 and 15 participants -- a total of about 140. Classes began in the beginning of the second year of the Project and continued through the second year of the Project. The winter classes are called Cycle 1; the spring classes are Cycle 2, and the fall classes are Cycle 3. In Cycle 1, in addition to classes for workers, there was a class for managers and office staff. In Cycle 2, in addition to classes for workers, there was another class for managers. Because production schedules -- and perhaps personal schedules as well -- prevented regular attendance by managers in Cycle 2, only half the sessions were held for that class in Cycle 2. This meant that managers took 5 of the 10 sessions that composed a class in Cycle 3.

The coordinator/instructor asked each participant to write a story about a communication problem that involved how language is used in an encounter between two individuals, an individual and a group, or in a group of people. The class read their stories together aloud and then picked three from each class to elaborate, edit and revise where necessary. This work was done in groups of four. When a group decided a story was complete, each person wrote a few sentences to describe the problem; the consequences of the problem; and alternatives or solutions to the problem. The coordinator/instructor then typed up the stories and selected comments from the students' analyses to add to the ends of the stories -- creating a collective commentary on the stories. After each class approved the coordinator/instructor's edits, the stories were distributed to the other classes. In this way, all stories became available to everyone. The edited "story-problems" became the collective property of all class participants, salaried and hourly workers alike. The class developed collective ownership of these stories so that all the workers identified with all the stories and the collection became more than just a numbering of individual stories with only individual ownership.

The coordinator/instructor spent time in each class distinguishing between organizational problems that give rise to communication problems and other types of communication problems. Given the course description and limitations of the instructor's authority, discussions of organizational problems were not undertaken. "Other types of communication problems" included those where the relationship of the people who are communicating become the focus of the exchange and the true intention of the communication is lost.

In this instructional environment, a class portfolio worked well, but individual student portfolios did not. The class portfolio became a statement of group intention and accomplishment. Individual portfolios were potentially threatening; workers feared that management might reference their individual communication problems. The coordinator tended to see "assessment" not so much as focusing on the individual but as assessing the collective learning experience, and how to improve the learning process. She believes "it's important to let people assess what is happening in the class as it happens. It's important to be open to them . . . ." The instructor/coordinator at AI/East Greenbush submitted an evaluation report to management. She believes that it is worthwhile to write an evaluation report that summarizes the learners' assessments, even if the audience may not agree with its conclusions. The evaluation report parallels the earlier WNA report, situates the class in the larger organization, lays out the problems to be dealt with in future classes and organizational development efforts, and offers the educator's reflections on what she did and how to improve it.

Math Course: The math instructor functions more like a traditional instructor than a coordinator/instructor, although he does communicate regularly with management. He became a part of the CLCI after it had worked out its goals and *modus operandi*, did not attend CPT meetings due to his busy schedule, and seemed, in general, to always be catching up with the collective purpose of the CLCI. However, his teaching is highly regarded and workers state that they have learned a lot from his classes. They say they are applying some of what they learned at home and are confident that application at work will follow. The content of the math course is basic math and algebra. This content was guided by the WNA results. The instructor has conducted systematic pre- and post-tests with workers. He has not developed individual portfolios for workers but may do so now.

Results

Communications course: *There* is evidence that participation in the communications course has achieved some results. Using the Kirkpatrick evaluation model as a reference, the results are:

(1) Workers liked the classes very much. Participation in classes improved, as did workers' attitudes toward learning;

(2) Workers learned the skills that the course taught, as evidenced by the instructor's observations and course materials; but

(3) Application of skills at work has been spotty. Neither workers, the instructor, nor the Human Relations Manager can attest to any substantial changes in behavior at work; and

(4) The effect of workers' learning and application of skills on the business has no way of being assessed at this point. Managers remain confident, however, that the benefits of this training will be manifested.

(5) There is no interest in formally assessing ROI.

Early in the course cycle, workers made the point that until managers participated in classes, change would not happen. They stated that learning new communication skills is pointless if managers do not have the same skills. Now that managers have attended classes it is still not clear what kind of change might emerge. As suggested above, some follow-up activities might help to focus discussion between workers and managers and move real dialogue forward. These activities could take place in a few additional classes or during already established meeting times when hourly and salaried workers come together.

The following report from a focus group with workers conducted in July 1996 summarizes what workers said they learned from participating in the communications course, and what they need to apply new communication skills at work.

- *What did you do in the class?*
  - -- identified communication problems on the floor
  - -- learned how to put ideas into forms that are communicable
  - -- learned how to listen
  - -- wrote fables on off-the-wall topics to make us feel comfortable with talking in a crowd
- *What did you learn?*
  - -- learned to listen
  - -- how to understand people's stories
  - -- how to communicate via a form to get our point across

-- how people handle and look at situations differently -- pessimistically and optimistically

• *What difference does this make on the floor?*

-- "We have always had good communication skills. It remains to be seen if we can use these skills. How management responds remains to be seen. Unfortunately, in the past we have learned things and not been given the opportunity to apply them..."

-- "It is not a question of having the opportunity to communicate. We have plenty of opportunities to communicate. It is a question of how well we are heard and responded to..."

Math course: There is evidence that participation in the math course has achieved some results. Using the Kirkpatrick evaluation model as a reference, five levels can be addressed:

(1) Workers liked the classes very much

(2) Workers learned the skills that the course taught, including understanding of finance, money, value and future value and use of statistical analysis for Quality Assurance

(3) Application of skills at work has been visible to some extent through informal observation, including workers' use of calculators and conversions to metric measurements, but workers say that the greatest amount of application of skills has thus far been at home.

(4) The effect of workers' learning and application of skills on the business has no way of being assessed at this point, although management is confident that benefits will become visible.

(5) There is no interest in formal ROI data.

Overall, the business commitment to workplace education and training continues to be strong. Besides the math class that began in the third year of the Project, other training programs have also been made available through the Human Resources Office.

Main Lessons from the Albany International/East Greenbush Program

There are striking lessons to be learned from the AI/East Greenbush program. The first lesson is about the extent to which the WNA identified an organizational need that an "outside" education program could only partially address. Whether workers are completely accurate in their assertion that managers do not communicate well themselves or managers have legitimate complaints that workers do not behave responsibly are not

points to argue. Some workers continue to perceive a resistance in management to treat them in ways that are wholly consistent with a high performance philosophy. Managers continue to express the point of view that some workers do not want to behave responsibly. The course opened up a dialogue about the perceptions that workers and managers have about one another and, in the process of opening up that dialogue, may have touched on issues that the organization itself is either not prepared to deal with fully, or not prepared to deal with in the way that the course suggested. Workplace literature is full of examples of companies that strive to flatten hierarchies and flourish through team work but who underestimate the challenges inherent in redefining the power relationships that have governed the workplace for so long. The circumstances at East Greenbush are even more confusing. The plant had been moving on a steady high performance course until a new Plant Manager decided that it was not entirely profitable to do so. How do workers -- salaried and hourly alike --- readjust? What are the parameters of the readjustment? Are they standardized or do they change with varying production demands? How are those changes communicated? These are complex questions that the communications course helped to articulate but could not answer. Presumably, management at East Greenbush will attempt to answer them, even if unexpectedly pushed to do so by an "outsider." From the company's point of view, it was not wholly appropriate for an "outsider" to attempt to deal with such systemically embedded issues. However, once raised, they will be dealt with.

The second lesson is about the importance of building corporate support for education in a company with many sites. As mentioned, HVCC conducts workplace education classes in both the AI/East Greenbush and AI/Menands sites. Although AI/Corporate is theoretically a stakeholder who should be represented on the East Greenbush EPT (and was represented in one or two meetings early in the grant), and on the Menands EPT as well, education staff ended up dealing with local management as if there was no coherent corporate policy about the role of education and training to support its direction and decisions. Local issues were locally arbitrated. While local control enabled each site to solve its own problems within its own cultural context, a mandate from -- and the full support of AI/Corporate -- to proceed according to the CLCI philosophy and plan would have likely facilitated the development of the overall program and helped to smooth the tensions between management and educators about "outsiders" raising difficult organizational questions. If AI/Corporate had sanctioned the education program to raise difficult questions through the WNA, and to address them through problem-solving based instruction, then East Greenbush management may have had an easier time with an "outsider" making suggestions about systemic organizational change.

The third lesson is about the process used to develop responsive curriculum. The curriculum that the on-site coordinator/instructor developed for the communications course gives new meaning to the phrase "customized curriculum." The process used to develop the curriculum goes beyond teaching grammar, vocabulary, or math in a specific manufacturing context. It responded to the need to study -- and potentially resolve -- real communications and organizational problems without inflaming workers' frustration with the slowness of change, and by creating a product (the class portfolio) that will continue to stimulate discussion and change.

Albany International/Homer
and Onondaga-Cortland-Madison (OCM) BOCES

Overview

The Albany International (AI) manufacturing plant in Homer, New York produces monofilaments, a kind of plastic thread, that is used to weave "clothing" for paper making machines. It is a small plant with about 100 employees. When the Albany International/Homer Collaborative Learning for Continuous Improvement (CLCI) program started, management's goal was to deliver training to approximately 50 operators through forty-five instructional modules that had already been partially developed by company supervisors. Operators are the frontline workers who virtually run the plant. One of the larger modules -- "Paperwork/Paperflow" -- was chosen as the starting point for the grant program. This is an especially large and important module because it includes the documentation of nonconforming products and problems that lead to defects. Additional goals developed for the program, with emphasis on paperwork/paperflow, include that technical machine operators:

- develop literacy and numeric skills that enable timely certification
- improve their team skills in communication, trouble shooting and problem solving skills
- develop a positive attitude/atmosphere toward training.

A detailed portfolio assessment process was developed to help the instructor and company representatives understand exactly what workers needed to learn in order to complete the paperwork/paperflow process without error. Forty operators were assessed with this portfolio process. About five months after the assessment was administered, 27 workers met in one or two small workshop sessions for 1 1/2 to 2 hours for a review of items needed to complete the paperwork/paperflow process without error. Although formal instructional time was limited to the workshop sessions, the portfolio assessment process was lengthy and provided workers with a variety of learning experiences that are detailed below. Total contact time for the CLCI program is calculated at 490 hours, delivered entirely on company time for a total cost to the company of $5,400.

Informal assessments of the workshop indicate that workers were not thoroughly pleased with the workshop schedule. Shortcomings of the workshop schedule, extensive changes in production processes, and management's new decision to develop a long term training strategy under the guidance of a new training supervisor influenced the workshop schedule and suggested that the program had to undergo significant changes. There was an intention that the workplace education program instructor would become an assessment consultant with instruction left to in-house trainers. Implementation was incomplete, however.

Business Context

AI/Homer is one of three Albany International plants involved in the CLCI. The other two are Albany International/ East Greenbush and Albany International/Menands. The Albany International/Homer plant is part of the Albany International family of manufacturing plants around the world. It is, however, an independent business entity. It sells both internally to its Albany International customers and externally to customers outside of Albany International. It strives to maintain a competitive edge among other monofilament manufacturers and to show a profit for itself and for the Albany International Corporation. Competition in all Albany International product markets, however, has been increasing. Competitors are underpricing, making it difficult for all Albany International plants to maintain, much less raise, costs of all items, from monofilament thread to completed machine "clothing." There is overall corporate concern that profits are not increasing at the desired rate and this concern is felt at the Homer plant. Managers continue to improve production processes and offer training that will, theoretically, result in improved products at stable, if not lower, cost.

About four years ago the company embarked on an ambitious training program. A small team designed the better part of 45 training modules that would theoretically cover all the training needs for about 50 operators. Management embarked on this training program for several reasons. Many of the applicants for hourly jobs did not meet the company's hiring requirements, which include GED or high school diploma, one year of experience in the industry, a willingness to work on the company's demanding schedule (changing from night shift to day shift every six weeks), and a willingness to get involved in the organization. Training would build the skills of employees in-house and help to create a knowledgeable and stable workforce, especially if acquisition of new skills enabled promotion to new job levels. Training would also enable workers to master new

technologies that are essential for producing better products and that are part of the company's plan for maintaining a strategic advantage over competitors.

In the second year of the Project, the company hired a new production manager who believed that the production process was not efficient enough. As a result, work processes are still being improved and training modules are being revised to reflect those changes. The crux of the change is alignment of work processes with new technologies. It used to be that all operators could work the production line from start to finish. Now work at the top-end of the process is more complex than before, involving the blending of raw materials on sophisticated machinery. As a result, work on the line was divided into three sections: "technical operators" who mix materials and oversee equipment; "extrusion operators" who are responsible for all activities between mixing and winding; and the newest employees, "finished-goods operators," who are responsible for everything after the monofilament is wound onto spools. This is one sign of the movement away from the company's being driven by sales to being driven by production. When it became clear that production could not execute the plans that sales and "technical" set out, new management focused on what would make production capable of fulfilling its potential. This entailed helping operators shift from seeing themselves as "workers who hold a job" to "manufacturing professionals who have marketable skills."

Also, in the second year of the Project, about 20 new hires were introduced to the new production process. Most of these new hires were in need of some training. In the third year of the Project, the company had to cast its recruiting net even wider than before. A local plant in a noncompetitive industry hired approximately 300 new workers, thereby depleting the local pool of even marginally qualified potential new hires. This continued to underscore the need for training of new hires.

Management has stated that training efforts in the past were "well-intentioned but diluted" and that hiring a professional trainer in-house insures that the money allocated for training will not be diverted elsewhere. Management learned several things from the second and third years of their grant program about incentives, logistics, and structure.

First, regarding the incentives needed to establish a viable training program, management now sees that it is necessary to "tap into the perception that something is to be gained from participating from training." That is, workers need a context that demonstrates the outcome of training is personal gain. Management said that the result of participation in the new work structure and training program would be internal promotion -- more responsibility and higher wages --, which is a natural incentive.

Second, regarding the logistics of running a viable training program, management said that a well-integrated education program "is much harder to pull off logistically" than they had thought. This refers at least to the fact that production in the Homer plant is continuous and it is not easy, therefore, to release workers for training that takes place on shift time. Requiring workers to attend training sessions on days that are normally slated for meetings or as time-off creates its own tensions. Nonetheless, as of halfway through the third year of the Project, all extrusion operators had completed half of a 20-hour training program on plastics by attending a half-day of training on a day they would have otherwise had off, with advance notice of this requirement by company management.

Third, regarding the structure of education at work, management said that they struggled throughout the Project to understand what the appropriate internal structure for education at AI/Homer should be. It became clear in the second year of the Project that a single adult education teacher, whose office is an hour's drive away from the plant and whose home organization is receiving only a fraction of a year's salary to provide services, could not meet the demands of a company whose training needs were mushrooming. Management realized that they could not go forward to the extent needed without hiring professional training staff who had experience in industry.

Educational Partner

Onandaga-Cortland-Madison (OCM) Board of Cooperative Educational Services (BOCES) has been providing workplace education services through other National Workplace Literacy Program grants and through direct contract to companies in the greater Syracuse area for six years. There is only one instructor from OCM BOCES whose time is partially paid to work with the AI/Homer program. This instructor has six years of experience teaching work-related basic skills in the workplace. She is based at the UAW/Chrysler Region 9 Training Center in nearby Syracuse. She became both the program coordinator and instructor for the AI/Homer site. The requirements of the CLCI grant (conducting a WNA, convening an EPT, developing an internal evaluation plan, constructing a site portfolio, etc.) were demanding, and the instructor spent more hours on-site than were scheduled or paid for during the first year and a half of the grant cycle.

The Partnership

About a year prior to the start of the CLCI program, at the request of AI/Homer management, OCM BOCES (Cortland McEvoy Center) tested all the operators at the

plant with the Educational Testing Service Tests of Applied Literacy Skills. Management was beginning to explore how to deliver training to workers and it seemed appropriate to test everyone, referencing a school-based model. Workers were put off by the testing requirement and thereby put off the idea of education and training at work. For some workers, the process too closely resembled a negative school experience. Nothing came of the testing except for the understanding that a successful work-based education and training program could not begin with traditional testing. The CLCI grant offered the OCM BOCES/ AI-Homer partnership the opportunity to rethink what it might offer to workers in an education program. The enthusiasm with which the instructor and management approached program development in the first year and a half of the grant cycle slowed as management reconsidered the scope of its training needs and the type of program that is best suited to meet those needs. As mentioned, company-wide training in many technical areas is needed to meet new production needs.

It is also suggested that, although the partnership has been very productive, there are two cultures with different work styles and work priorities attempting to create a program together. Management has been critical of the CLCI's "non-value added" activities, namely the time spent in conducting a WNA, developing program goals and an evaluation plan, attending state-wide meetings and trainings, reporting to federal funders, and dealing with many layers of bureaucracy before funding is actually received. From management's perspective of the limitations of the CLCI grant, these and other related issues may have influenced the decision to hire a training supervisor. A federally funded grant program might initiate a company-based comprehensive training program, and in so doing fulfill the mandate of the federal program. A federally funded grant program could not, however, fill all training needs, especially highly technical ones.

The EPT

The program at AI/Homer started off with an active EPT composed of two representatives of management (a Quality Control Manager and the Human Resources Manager), the Training and Safety Coordinator, four extrusion operators, and the OCM BOCES coordinator/instructor. For roughly the first year of the program, after the EPT was formed, the EPT met about once a week. In Year 2, the EPT rarely met as a team due to three factors: (1) the EPT's primary focus -- organizing, carrying out, and acting on the WNA -- was completed by that time; (2) the EPT's key management representative was given a new position which required her to be focused more on production than

human resource issues; and (3) workers were less available to interact with the site coordinator due to increased production and due to an accident which occurred in spring of that year. In Year 2, however, after the portfolio assessment process was developed, the OCM BOCES coordinator/instructor met regularly, although informally, with the Quality Control Manager. Toward the end of Year 2 and into Year 3, communications between management and the OCM BOCES coordinator/ instructor became less frequent. This was due to at least two factors: (1) the Quality Control Manager with whom the OCM BOCES coordinator/instructor communicated most frequently often worked the night shift, making it difficult to coordinate meeting times; and (2) management in general was dealing more with large questions about how to proceed with an overall training program and less with how to work with the relatively small CLCI grant program.

Shift changes (from day to night and night to day) for the operators who volunteered to attend EPT meetings also made it difficult for them to attend the EPT meetings regularly. This problem was exacerbated when a company policy of mandatory overtime relieved all employees of obligation to go to any extra meetings. This describes an EPT structure in which workers could not participate fully. Except for a meeting with the evaluator at the start of Year 3, plans to reconvene the EPT have not, as of this writing, been implemented. It is unlikely that it will meet again as originally intended.

EPT activities in Year 1 focused on choosing WNA questions, conducting the WNA, analyzing the results, and developing the portfolio concept and the plan of implementation. The major decision that the EPT made in Year 1 was to conduct an intensive portfolio assessment of workers' abilities to complete the work in the paperwork and paperflow process. This portfolio assessment process, implemented at the start of Year 2, became the central feature of the educational program. It provided important learning experiences to workers and led to significant workplace outcomes. It also set the stage for the workshops that were offered to workers in the third quarter of Year 2.

The current inactivity of the EPT does not seem to be the result of a lack of fit between the EPT structure and corporate culture at AI/Homer. Work in the plant is conducted regularly in teams. The reasons explored above are more likely to explain why the EPT is not currently active.

The WNA

In order to conduct its WNA, the EPT first stated a WNA goal and then conducted a survey, focus groups and interviews with as many plant personnel as would

participate. The EPT interpreted the results of the WNA and formulated the program on the basis of the results.

The WNA goal statement was: "We will conduct a WNA to find out the training and educational needs of all Homer Albany International personnel. The purpose of the organizational needs assessment plan is to make short and long term organizational recommendations. Our primary goal is to implement training that will promote our ability to keep up with changing environments. Therefore, our focus will be to develop programs that will equip employees with the skills and knowledge required to perform their jobs, thus making everyone's job easier." The survey that was distributed to all plant personnel was based on the one developed for the WNA at AI/Menands. It was distributed with a memo that invited everyone to participate in a project called "All about Job Skills" and asked them directly for "input about the skills and training required to meet the challenges we face everyday." The memo explained that this project was part of a collaboration among other businesses in New York State and the New York State Education Department. It asked personnel to please follow up on the survey by participating in a focus group or interview. Approximately 10 managers and process engineers signed up for the focus groups but hourly workers did not sign up, most likely because they were tired after working a 12 hour shift. As a result, the coordinator/instructor interviewed as many hourly workers as possible by appointment in the resource room or cafeteria or by their workstation during shift hours. Approximately 40 hourly workers were interviewed.

Training goals that emerged from the WNA process include:

- Improve computer use skills
- Improve trouble shooting and problem solving skills
- Have a broader and better understanding of the extrusion process
- Improve the basic skills needed to support the understanding and operation of the extrusion process
- Make training a positive experience for all employees
- Improve plant-wide communications
- Promote and improve teamwork

In addition, many participants felt that there was a need for a plant-wide educational plan as well as a timeline for implementation of this plan. This is especially interesting in light of management's recent decision to hire a training supervisor. The training supervisor will be expected to create and implement a plant-wide educational plan like the one referenced in the WNA results. WNA results placed a high priority on job-

specific and technical courses that integrate basic skills with the extrusion machine operation and new computerized technology. The EPT eventually decided to focus instruction on one module of the 45-module training program -- a large and complex module called Paperwork/Paperflow.

Instruction

After the WNA was completed, the EPT was still working under the assumptions that traditional classroom instruction would be provided and that portfolio assessment was to be a "key tool in the assessment of classroom progress." Shortly thereafter, due to the enormous effort that went into designing a detailed portfolio assessment process for the Paperwork/Paperflow module and the difficulty in scheduling classes during shift hours, the program emphasis turned to portfolio assessment both as an assessment of operators skills and as a learning opportunity. It is also possible that in the first and second years of the Project, management was reluctant to hold classes without a "set" curriculum. Steeped in adult education practice, the coordinator/instructor had proposed a curriculum process that would have developed its content in response to workers' needs to develop problem-solving and team-building skills. It is possible that this approach was, potentially, too open-ended for management to support. They chose to move in the direction of supporting the development of the already existing training modules -- a long standing training goal for the company.

The task that formed the core of assessment and instruction was to have workers record enough information in sufficient detail and with such accuracy that it would help others in the plant to solve problems and troubleshoot issues. The goal was also for all operators to understand why accurate recording is important. Forty workers were assessed using a "model portfolio." The model portfolio was a collection of properly completed workplace paperwork from which the EPT developed a criterion sheet that described characteristics or indicators of properly completed paperwork. The instructor showed the model portfolio with criterion sheets to the production area employees and asked them to collect samples of their own paperwork over a period of several weeks. She gave written directions for this task as a way of determining whether the participants could follow written instructions. Over a two-week period, workers gathered samples of their work in working portfolios.

This process proved to be tedious because it required workers to collect, copy, use and store 14 pieces of paper in their portfolio. The instructor and a management

representative reviewed each portfolio to determine how the workers performed particular required tasks. This review process itself took considerable effort, especially for the company representative who, as the "expert," reviewed 14 documents each for 40 workers. From the working portfolios, the EPT identified training needs that could be addressed in instructional activities.

The format for the initial round of instructional activities was a combination of one-to-one tutorials and group workshops. As the workers returned their portfolios in late 1995, the EPT quickly took note of particular problems apparent in the contents. EPT members responded to those problems with targeted, customized one-to-one instruction carried out in individual conferences or with a group session. Typically, for example, a learner would be shown a better way of carrying out a paperwork task; the learner would go out and try it on the floor; and then she or he would return to show the instructor how she or he did and to get additional guidance. As another example, when several workers appeared to be having trouble filling out accident reports, the EPT organized a workshop to help those workers understand how to deal with that common problem.

The portfolio was thus seen as a focal point for learning activities, rather than merely as an "assessment" tool tacked on to instruction. Learners used materials from their portfolios, revised them, added new ones, and thereby documented what they were learning as they proceeded. This process helped learners to clarify their needs for future learning activities while also documenting in one place -- in a "mastery" portfolio -- what they knew. For example, the learners' portfolios demonstrated their ability to follow directions and make choices. In the process, the instructor identified who the "experts" were (i.e., those with particular expertise in various areas) and got them to help in the instructional process, as mentors and/or resource persons.

In addition, about five months after the portfolio assessment was completed, mandatory workshops were held for all operators whose initial portfolio assessments indicated that they needed some instruction in order to complete the paperwork/paperflow process without error. Twenty-seven extrusion operators met in one or two small group sessions for 1 & 1/2 to 2 hours on "meeting day," a day that is usually reserved for meetings but becomes free if there are no meetings scheduled.

Some workers became resentful that they had to spend time on meeting day in a workshop whose purpose was not a priority for them. A significant amount of time had elapsed from the first assessment in early winter to the workshop in late spring, and any

sense of urgency or excitement about the workshops passed with it. With hindsight, the coordinator/instructor understands that the portfolio process should have included some kind of contract that workers signed that committed them to participate in instruction related to the assessment. Without that contract it was difficult for workers to remember that they had agreed to participate in training, much less to be enthusiastic about learning things that they mostly felt they already knew. It was especially difficult for the instructor to be in the position of co-teaching a workshop with the Quality Control Manager for workers who did not want to be there. Company people may be somewhat accustomed to workers griping about being someplace they don't want to be, but it was difficult for an educator who had worked very hard to keep her relationships with workers upbeat and positive. Management continued to state the position that instruction cannot take place on company time.

The mix of one-to-one instruction and short, focused workshops is a departure from more common workplace education approaches which try to "fit" busy companies and workers into traditional classroom models. Despite the difficulties with the workshop, the mixed format helped to create an atmosphere for ongoing career development and learning.

An extra note on individual assessment

The above description of how portfolios are woven into the instructional process indicates how individual assessment was seen as integral to the learning process. This allowed learners and the company to clarify workers' abilities and workplace documents that needed to be changed.

Learning activities were structured to produce clear documentation (e.g., checklists) which showed workers' abilities in certain areas. This documentation was stored in participants' work portfolios as an ongoing record of workers' needs, abilities, and work.

This use of portfolios is particularly useful in a workplace education initiative where procedures and operations are the focal point. This process also is helpful to a company that does not have written procedures in place. A company can work with workers to develop written procedures, help workers master those procedures, and then have a written record of what each worker learned. This is especially important for companies undergoing ISO 9000 certification.

Results

There has been no formal assessment of achievement of goals in the AI/Homer-OCM BOCES program. Results have been noted informally, however, in several ways.

(1) Portfolio assessments resulted in unanticipated learning for employees and unanticipated improvements in the paperwork/paperflow process. In the course of completing the portfolio assessment, workers put more thought into the paperwork/ paperflow tasks they are required to perform and noted changes that might improve their work. Two examples illustrate this result. One, operators approached the Training and Safety Coordinator about changing their "start-up checklist," the first document in the portfolio. They said the form was too confusing and items were out of order. The Training and Safety Coordinator spent three weeks meeting with several operators to revise the forms that are now acceptable to everyone. Two, the Training and Safety Coordinator and coordinator/instructor noted that there was not enough information on the "log sheet," another portfolio document, to give process engineers adequate information to troubleshoot. Operators would note that a machine was down but not provide an explanation. The process engineers designed a new form that listed the probable causes of a machine being down so they could trace problems and troubleshoot better.

There is no way to know whether these improvements led, in turn, to other noteworthy outcomes. Formal evaluation activities were not conducted in Year 3.

(2) Although workers' responses to the required workshops were not altogether positive, the coordinator/instructor notes that workers' attitude toward training had become more positive overall.

(3) The company commitment to conducting ongoing training is stronger than ever. While this commitment was present before the program began and thus cannot be attributed exclusively to the CLCI program, the program has helped the company to clarify the extent of its training needs and how to meet them.

Main Lessons from the Albany International/Homer Program

There are several lessons that can be drawn from the AI/Homer-OCM BOCES program. One set of lessons involves instruction -- how it is defined and delivered and how it achieves results. Another set of lessons involves the limits of partnership that can be forged between an educational provider with limited technical knowledge and a business with evolving technical training needs and minimal structured education team

communication. The third -- related to the second -- concerns how programs evolve in ways that are unpredictable at the start of a grant cycle.

Instruction: The AI/Homer program raises interesting questions about how one might build learning opportunities at work through integrating assessment and learning, and work and learning. The initial portfolio assessment and individual worker conference worked well as a learning format. In this type of portfolio assessment, a worker is immediately shown what s/he knows in a particular module (e.g., paperwork/paperflow) and what s/he needs to learn more about in order to work without error. The assessor/worker pair can then decide on a learning plan. Several options for learning grow out of the portfolio assessment process. While it is unlikely that all these options will be implemented at AI/Homer, they grow out of the program experience at that site and contribute to imaginative thinking about workplace education service delivery. Options include that the worker:

- learns some things on the spot with the help of the assessor/instructor
- is paired with a mentor (like an apprenticeship)
- gets support to attend individual or group training, in-house or out.
- makes changes in actual work processes as a result of learning through intensive assessment.

Partnership. The AI/Homer program also raises interesting questions about the extent to which adult educators who are not engineering experts can be integrated into a manufacturing company's work-based training program. In most workplace education programs, adult educators teach basic skills within a work context. The work context may be more or less complex but the focus is on basic math, reading, writing, and communication. At AI/Homer, there are some workers who might benefit from a genuine basic skills focus but most operators need support with technical learning. A coordinator/instructor is not the best candidate to teach technical knowledge about the extrusion process. The company had to adjust its expectations about what a single, part time instructor might accomplish even in a small plant. The plan to use the coordinator/instructor as an assessment resource for the balance of the training modules spoke well of the partnership's ability to reset expectations and match talent to job in an efficient way. That plan, however, was never fully realized. It appears that the CLCI grant helped the company think through a strategy for delivering training that meets the plant's training needs. The company's new training strategy is better integrated into workplace culture than what CLCI was able to provide.

Unpredictability. The corollary lesson from the AI/Homer experience is that programs may evolve in ways that are often unpredictable at the start. The AI/Homer education and management staff had the expectation at the beginning of the program that some kind of instruction would be provided that was more like traditional classroom instruction than not. The program evolved, however, to focus almost exclusively on the assessment process and the learning aspects of that process. The program paved the way for management to understand that technical training, distinct from basic skills instruction, needed to be provided through company-sponsored, not grant-sponsored programs. The program also illustrated that basic skills programs need their own focus and venue or risk being lost amongst more technical training.

Albany International/Menands and Hudson Valley Community College

Overview

The Albany International (AI) manufacturing plant in Menands, New York produces "clothing" for the paper making industry. "Clothing" is also called "felt," evoking an image of a sturdy fabric on which paper is rolled through huge industrial paper making machines. Felts are woven with plastic monofilaments -- threads -- manufactured in other Albany International plants. The AI/Menands plant specializes in the production of felts for the "drying" section of paper making machines. It also manufactures corrugator belts for boxboard and "primaloft," an artificial polyester down. AI/Menands is a medium-sized plant with about 215 employees, of whom 185 are hourly employees. The general purpose of the AI/Menands Collaborative Learning for Continuous Improvement (CLCI) program is to support all employees to become "proactive workers." The specific goals that emerged from analysis of WNA data also reflect the company's desire to support employees' participation in all aspects of a high performance workplace. The goal is to improve an employee's ability to participate in the activities of a high performance company through developing:

- knowledge of and comfort with problem solving techniques
- essential self esteem, then knowledge of and comfort with team communication skills
- knowledge of and comfort with analytical reading skills for technical materials
- knowledge of and comfort with basic mathematical skills and applications.

The first CLCI class at AI/Menands focused on problem solving and communication skills. It specifically addressed how to communicate to workers who were not enrolled in the class the types of benefits packages available to them (especially investment and retirement options) so that workers make sound choices about them. About 17 workers were enrolled in the class. The second CLCI class at AI/Menands also focused on problem solving and communication skills. It specifically addressed how to increase the complexity and diversity of design work allocated to the 3rd shift. Nine workers were enrolled in the class. The two problem solving and communications classes were followed by two Advanced Math classes. During the time that Advanced Math was being taught, the need for a Beginner's Math class for workers in the pin-seaming department emerged, as did the need for a class in Basic Business Management for workers who want to know more about how the AI/Menands business operates. As of this writing neither the Beginner's Math class nor the Basic Business Management class have been conducted. Total contact time

for the CLCI program is 1,716 hours, delivered on company time for a total cost to the company of $45,960.

Documented results of the first two courses are spare but informal assessments of the courses' benefits are readily available. For example: (1) after the benefits seminar that workers conducted as part of course #1, workers conferred with Personnel Office staff and changed their benefits packages; and (2) 3rd shift workers felt recognized by management, something that, before the class, they believed could not happen. They take greater pride in their nighttime productions and believe that they are making a bigger contribution to the overall success of the business. Results of the two sections of Advanced Math have yet to be documented in the site portfolio. The main question to be answered for the AI/Menands program is why the program stalled in Year 3, while the company continues to express an interest in it. Examination of business priorities and staff changeover provides some answers.

Business Context

The AI/Menands plant underwent a transformation a year or two before the Project began. At that time, an entire level of management was removed, leaving only 12 managers in the plant. TQM and team work -- central features of the high performance workplace -- now characterize the AI/Menands organization. Business conditions have been favorable in recent years. When the CLCI project began in late 1994, the company was having an outstanding year. Paper machine clothing manufacturing, however, is a cyclical business and in 1996 the business slowed down again. The number of competitors in the market has not increased but competition is keen. Discounts continue to go up and prices are eroded. Corporate management has suggested that, if AI/Menands cannot return 18% to 20% in profits per year, then perhaps the company should go into manufacturing something else that can return a safe rate of profit. In 1996, the second year of the Project, the Director of Personnel stressed that, in this climate, there is strong corporate pressure to produce and there is also, therefore, some reduction of TQM, education and training efforts.

At the same time, he said that there is a need for workers to understand the business more and for workers and supervisors to discuss policy together. He claimed that the program's focus on math opened up channels of communication between workers and supervisors not possible when the focus was on communication skills per se. Math is "more objective" and, when taught by a male teacher[1] who quickly became part of the corporate culture, supervisors "opened up" rapidly. He said that the basic goals of the program had

[1] Whether the teacher's gender was influential in this shift is debatable, and we make no such claim.

not changed and that the future of the program was in math and basic business management, not communication skills.

These statements were made roughly six months before the Director of Personnel left his job at AI/Menands for a new job at the beginning of the third year of the Project. No new courses have been taught since. The EPT met only once in late March, with only six months left to go on the grant, and only managers and the Project Coordinator attended. Several factors joined together to stall this promising program.

First, the Director of Personnel represented the education program on the company side. In the months before he left, with a hectic schedule in front of him, developing the basic business management course was not a priority, much less keeping the program fully enrolled.

Second, change in program staff from the communications teacher to the math teacher slowed the program's momentum significantly. The communications teacher saw herself as part of the CLCI project and brought great enthusiasm to her work. The math teacher who replaced her has not been able to participate in CLCI activities. While he has fulfilled his teaching responsibilities and won the accolades of workers, he has not taken the lead to convene the EPT or develop the program. This places the onus of the work on the off-site coordinator, who already has a full-time job.

Third, even without staff turnover, it may have been difficult to develop a well-directed educational program when the company's priority was on production. Unless the company has articulated a relationship between education and long-term cost-savings, education will invariably be seen as competing with production. Market conditions put pressure on the company to produce more. In this climate, even in a workplace that strives for "high performance," education and training are doled out in careful measure, not provided in abundance.

Educational Partner

The Office of Technical and Professional Training at Hudson Valley Community College (HVCC) has been providing workplace education services to businesses in greater Albany since 1984. The Director of the Office of Technical and Professional Training acts as off-site coordinator for the CLCI program at Menands. Until spring of 1996, halfway through the second year of the Project, the communications teacher acted as on-site coordinator. Her replacement, a math teacher, did not step into this role, leaving a gap in on-site coordination.

The Partnership

HVCC had been providing training at AI/Menands for five years before the CLCI grant was awarded. Classes, paid for by the company, included study skills classes, short and basic math classes, welding, electrical maintenance and blue print reading, among others. Participation was low. This prior relationship between the company and HVCC made a partnership through the CLCI seem natural. However, a pattern may have been established before the CLCI that education activities progressed "course by course" rather than through a strategically planned three-year long program. Without an on-site coordinator beyond the midpoint of the grant to ensure that a long-term strategy was in place, it was easy to fall back into an old form of relationship.

The EPT

The EPT is now composed of the HVCC off-site coordinator, the instructor, the replacement for the Director of Personnel, several workers, and a couple of supervisors who rarely attend. In the first grant year, the EPT met about every six weeks. In the second year, meetings dwindled to two or three. The first meeting of the third grant year took place in late March with only a fraction of the original membership. The former site coordinator had selected EPT members based on her knowledge of plant personnel prior to the CLCI grant. This group worked well together, despite the difficulty of getting supervisors to attend. The group, however, lost momentum after not meeting for so long.

The WNA

The off-site and on-site coordinators took the lead with designing WNA questions because they had been trained to design them. The on-site coordinator convened the EPT and presented the WNA tasks and questions. EPT members reviewed the WNA questions. WNA questions were distributed to all employees and then the on-site coordinator conducted interviews and groups with 1st and 2nd shift employees. The on-site coordinator for the CLCI program at AI/East Greenbush, which is also affiliated with HVCC, conducted interviews and groups with 3rd shift employees. The AI/Menands on-site coordinator took the lead in analyzing the WNA results and the EPT reviewed them. She also wrote the WNA report. The WNA showed that the plant's workforce is composed of experienced workers with strong technical skills and a high quality ethic but with insufficient "softer" skills, like problem-solving and communications, required in a team environment. The WNA indicated a need for educational activities that helped employees work in teams, communicate and solve problems.

Instruction

The following table summarizes the courses that were offered through the AI/Menands CLCI program.

Course Name	Description
Problem solving and communication skills	Spring 1995; 40 hours; 1st shift; addressed how to communicate to workers the types of benefits packages available to them (especially investment and retirement options) in order to ensure that workers make sound choices about them. Class enrollment was about 17.
Problem solving and communication skills	March/April 1996; 20 hours; 3rd shift; addressed how to increase the complexity and diversity of design work allocated to the 3rd shift. Class enrollment was about 9.
Advanced Math	Winter 1995-1996; 2 sections offered; 20 hours each to a total of 22 workers.
Beginning Math	To be designed for the pinseaming department
Basic Business Management	To be designed for interested employees

Problem-solving and communications. The first communications and problem-solving course was originally intended to focus generically on problem-solving but workers asked for the focus on the benefits package. Understanding and communicating about the benefits package were not, however, the goals of instruction. Workers were to improve their abilities to gather information, manage it, analyze it, and make decisions with it, both as individuals and in a team setting. Both problem-solving and communications classes were set up as Process Improvement Teams (PITs) to emulate the teams' work on the floor. The first PIT designed a seminar on the benefits package that they felt would appeal to their peers. The seminar was so successful that the team was asked to repeat it and resulted in many workers at least discussing their benefits packages with a representative from the Personnel Office. The first round of instruction thus used the company's insurance and retirement benefits package both to teach reading, writing, math, problem-identification and -solving techniques, and to provide opportunities to practice proactive teaming skills such as listening and negotiating. This work built on the foundation of the company's Learning Enhancement Program (LEP), which had begun with individual basic skills assessments in late 1993 followed by basic skills classes in 1994.

The second communications and problem-solving course supported 3rd shift workers to determine how to work with the more interesting R&D fabrics manufactured during the day shift, when the designer and engineers are in the plant. The content of the 3rd shift class evolved as follows. The instructor began the class with a focus on problem-solving and invited workers to identify the problems on which they would like to work. Workers were "very resistant." They did not believe that the company was or would be responsive to their needs. They felt that they were not given any chance to work on interesting designs. The boring, tedious jobs were left for them on 3rd shift, when no engineer or designer was present to help with a problem, or guide the process. At the same time, management was beginning to expect all shifts to use new computer machinery. It was expected that production demands would require the new machines to be in use 24 hours a day. Third shift workers told the instructor that they wanted an opportunity to work on interesting designs but that it would never happen. The instructor happened to be friends with a designer from the 1st shift. The instructor talked to this person who responded well. This 1st shift designer took the problem/request to the Director of Personnel, who then arranged to have a designer come into the 3rd shift two days per month, and an engineer one day a month. Apparently this is enough support for the 3rd shift to handle more complex designs.

Math. During the winter of 1995-96 the new math instructor taught two sections of Advanced Math (Math 3), which covered such topics as algebra, trigonometry, geometry, probability and statistics, use of the scientific calculator, charts, conversions, and personal and corporate finance. Classes were divided into three 10-week "sessions" consisting of one 2-3-hour class each week. The need for an advanced math class had emerged from an intermediate level math class (Math 2) that he had taught outside the grant and also from the former instructor's communication skills class, where the need to deal more quantitatively with benefits issues emerged. The instructor encouraged learners to find relevant tasks from their daily lives on and off the job on which to focus instruction. For example, learners might review the math required to understand their company benefits package or to build a deck. As he taught the advanced math class, a need for a beginner's math class, especially for workers from the pin-seaming department emerged. There is a need for workers in that department to improve their confidence and skills to measure and calculate the width of the fabric they work on. The company will also be converting to the metric system in the near future and workers need help with the conversion calculations.

The instructor had not yet conducted mini-WNA as of this writing. When he does, activities will include:

(1) Examination of trailer cards -- Are the categories correct? Is the information placed efficiently on the card? Are trailer cards in sync with what workers actually need to do to get the job done?

(2) Determination of workers' abilities to read and understand the ISO manual and the ISO manual's accuracy.

(3) Exploration of how to reduce the workers' reliance on the designated designer in making calculations -- Reducing reliance on the designer will reduce the amount of time the designer spends in rework, allow her to troubleshoot more, and reduce the overall number of times calculations are performed. At present, time is wasted on multiple calculations and it is likely that there is also wasted product. It is likely that there will be two sections of Math 1, each 20 hours, for a total of 40 hours. There will also be one Math 2 class and one Math 3 class, each for 20 hours bringing the total number of class hours up to 80 hours.

Basic Business Management. Management made a request for a class in basic management for hourly workers. The problems that identified the need for this course include workers not knowing the chain of command nor understanding the conventions and structures of work. Some workers also have expressed interest in basic principles of management. It is unclear whether the instructor is prepared to teach this course and whether management is prepared to sponsor it.

Use of Portfolio Assessment. Although the instructor for "Problem Solving and Communication Skills" used individual portfolios, she found that it was difficult for workers to monitor the collection of their own documents. She found that it was very demanding for her as an instructor to monitor the collection of documents for a full class and to respond to each workers tests, charts, resumes, etc. Furthermore, the emphasis on team work in the class and the structure of the class itself as a PIT made it more natural to think in terms of a class portfolio than individual worker portfolios. The math instructor has not used portfolios but may use them for any new course he teaches. To assess and track learner skills and needs, the instructor conducted periodic "teacher-made" tests. He would share results with the learners and would give general but not worker-specific feedback to management, summarizing in general terms what learners were learning and feedback which learners gave on an end-of-session evaluation form.

Results

There are a few documented results only for the first communications and problem solving course. Using the Kirkpatrick model[2] as a reference, the results include:

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[2] Donald Kirkpatrick, *Evaluating training programs: the four levels*. Alexandria VA: American Society for Training and Development and Barrett-Kohler, 1994.

(1) Workers liked the classes very much.

(2) Workers learned the skills that the course taught, as evidenced by the instructor's observations and course materials. Notably, workers attitudes toward learning improved; they became more proactive and developed self esteem.

(3) Application of skills at work has been visible in one particular way: workers became more proactive in managing their retirement portfolios, evidenced by an increased number of focused visits to the Personnel Office. The representative from the Personnel Office who was a member of the focus group reported that 20 percent of the attendees at the benefits seminar organized by class members changed their benefits package. Soon after, when another seminar was given by a professional agency on the same topic, 60 percent of the attendees changed their benefits package.

(4) The effect of workers' learning and application of skills on the business has not been assessed. Managers remain confident, however, that the benefits of this training will be manifested. For example, it is thought that workers who are confident that they have good retirement packages may be better workers. Learners themselves said that the courses enabled them to help their children with schoolwork, helped them better understand job-related math, inspired them to go back to college, and helped them with home projects. Two employees even became leaders in their sections of the company after learning good teamwork skills as PIT team members in class.

(5) Formal ROI measures do not interest staff in this site.

An employee focus group provided statements about what workers had learned in their courses. Five of the seven members of the focus group attended the communications skills class and at least one math class. Members of the focus group mostly discussed the math classes that they had attended, with some references to the communications skills class. Workers said that they learned how to calculate profit rates and interest rates; work in circumference and volume; plot charts and percentages; do basic trig in Math 3. They said, however, that it is not easy to make direct applications of skills learned in class to work. They said that the classes helped them to understand the business better -- to get a better understanding of how the business works, especially how profit works. This in turn helps workers understand why management makes the decisions it does, and therefore helps the workers accept change better. They also said that one might not have an opportunity to apply a new skill "until a later date," signifying an awareness that a time might come when an opportunity for a more direct application of new skills will arise. They said that there is now a calculator at each workstation in the weave room and that workers who took a math class are comfortable using it.

Main Lessons from the Albany International/Menands Program

"Productivity takes precedence." The main lesson we can draw from this site is that a workplace education program is unlikely to flourish when a company is focused on production in a tight market and education staff are either not fully invested in the program or do not have the time to do what's needed to keep it running continuously. Perhaps the fact that HVCC had a prior contract with AI/Menands in which instruction was provided course by course subtly biased the CLCI program to see itself as a collection of courses, but not quite a program. The new instructor's participation in a CPT meeting or statewide training would have helped to integrate him into the larger program and possibly motivate him to support the local site's program to a greater extent. However, this did not happen before the end of the grant.

Turnover of management staff slows the pace of program development: The program lost momentum when the dedicated Personnel Manager took a job elsewhere. This one person provided strong support to maintain the program's pace and to persuade other managers of the program's worth to the company. Despite the fact that a supportive person has taken on half of the former Personnel Director's job, it is difficult to maintain the original pace.

Results of one small course may impact a company over time. More than two years after its conclusion, results of the first communications' course are still evident. Workers continue to query Personnel Office staff about benefits based on the success of the course two and a half years ago. No one could have predicted how widespread the results of the first communications course would be. Memories of the seminar that class members presented are still vivid. The topic and the manner of presentation affected many workers deeply. It was a genuinely worker-driven class presentation based on a problem that the class identified.

An education program can help to leverage needed organizational change. A portion of the plant that is typically neglected and identifies itself as marginal-- the 3rd shift -- was more integrated into company life as a result of the communications course. The fact that engineers visited the 3rd shift and worked with workers during the night hours legitimated the 3rd shift in unanticipated ways. While there are no numbers that measure expanded capacity for complex design, it is clear that capacity was expanded and that some benefit was likely derived from it.

Delphi Energy/UAW Local 1097 and Rochester City Schools

Overview

Delphi Energy is a manufacturer of GM car and truck parts. This project is operated through a partnership between UAW 1097 and the Rochester City Schools Adult Education Department. The Collaborative Learning for Continuous Improvement (CLCI) program offered four courses, two each in Statistical Process Control (SPC)/Problem-solving in specialized applications areas and in problem-solving/teamwork/communications. Approximately 53 (duplicated count) employees participated in at least one course during 860 hours of contact time, all on company time for an estimated cost of $17,500 to Delphi.

The primary goals at the project's outset were:

1. Workers have input into the training they receive and opportunity to voice concepts and ideas for continuous improvement
2. Make workplace education a part of the evolution of the high-performance workplace at Delphi
3. Build SPC-related skills among operators
4. Workers have skills to participate in problem-solving activities.

Through its first round of SPC courses for the fuel-injection program, the participants demonstrated high levels of competence in SPC and problem-solving skills in the classes. They demonstrated on the job that they could apply the skills to the actual SPC charts generated by their machines, use the charts to solve problems, take more initiative in identifying problems, communicate more and better with engineers, and have higher morale and improved attention to quality concerns. This production unit reports 461% improvement in the defect rate compared to a similar production unit not receiving this training and 514% savings in scrap costs compared to the rate projected and budgeted based on historical data for this unit. Results of the second round, for the Linear EGR assembly, indicate improved competency in SPC skills and their applications on the job. The two problem-solving/team skills/communications classes developed solutions to persistent plant problems, though consideration of their implementation has been delayed by significant management changes.

Business Context

Delphi Energy, formerly AC Delco, is a Rochester NY operational component of Delphi Automotive Systems, the subsidiary of General Motors that manufactures parts for GM cars and

trucks. This project is operated in a partnership between UAW 1097, which has contractual responsibility for all training programs, and the Rochester City Schools Adult Education Department. A critical, and somewhat unique, feature of this plant, according to the union leaders, is that it has a more cooperative relationship between union and management than other Delphi plants seem to have. It also appears to have a more highly skilled workforce than the other Delphi plants, evident when new employees come to this plant from others and demonstrate lower skill levels.

The industry market and employment context over the past few years has been fairly stable. Significant features include that Delphi is selling products on a lower profit margin that before. They manage this through a leaner production process, requiring fewer employees than before for the same level of output. Consequently, employee attrition has been about 3 - 4 percent per year, but below three percent in each of the past two years. The few new hires among production employees have been transfers from other GM plants. Thus, Delphi is not greatly affected by the general employment or economic conditions of the Rochester area. Average seniority at the plant is about 20 years. With good pay, benefits package and working conditions, few employees leave other than through retirement or moves to other cities.

The plant is structured with three management levels, which is flat for a plant this size. Recent and still developing operational initiatives include a Quality Network (their variation on TQM), QS9000 (a variation of ISO), and cross-functional team development. When this project got underway in late 1994, the plant was in the midst of creating a new product line with new work processes and new work teams. That line was to have volunteer employees and require better communication and attention to quality. The attention to quality was to be strong enough that GM said it would buy its fuel systems elsewhere if the plant didn't meet quality standards. The basic skills program was seen as a tool for helping the plant make that shift.

Educational Partner

The Rochester City Schools (RCS) adult education department has provided workplace education for several years in a number of business and industrial organizations. During the period of this project, they provided two part-time staff for a learning center at the Delphi site, and two additional part-time teachers for the classes in this project. They also provided three other teachers, again part-time, to teach other classes at Delphi not part of the CLCI project.

The Partnership

This partnership between RCS and Delphi existed for a number of years before the CLCI. Under this new grant, RCS staff worked with an existing team which had been set up to oversee the plant's transition to the new product line. In early 1995, the team did a modified workplace needs assessment, reviewing the strategic plan which the team had already developed to clarify where the CLCI problem-solving curriculum might fit in. There was an ongoing smooth partnership evident in such activities as the EPT's functioning, management support of classes, participant release time, and collaboration on decisions. Those functions continued to progress well during the active periods of the project, with apparently mutual support between the partners.

The Educational Planning Team (EPT)

The EPT generally met weekly for the first months of 1995 to affirm the program goals, acquaint all parties with the CLCI project, develop a more detailed plan, and assign responsibilities and tasks to members. The participants included two union stewards, the prospective SPC course teacher, Delphi management representative, operators in the work unit, engineers, the RCS project coordinator and other teachers. After the general plans were in place and a common understanding among members was gained, then the general meetings were held monthly, with subgroups meeting as needed and individuals carrying out assigned tasks. The EPT operated with semi-formal procedures, using written agendas and documenting main points and decisions as needed.

At the start of first round of the SPC courses, in Spring 1995, the EPT disbanded. A new EPT convened in Spring 1996 to begin planning the next activities, namely the problem-solving classes and another SPC course. A significant feature of this reconvened EPT was that management became more actively involved in helping define the curriculum, particularly the selection of problems for the problem-solving courses, than they had been for the early training activities. They did so in response to the general realization from the early activities that by so doing the training would be more effective in its workplace impacts.

The Workplace Needs Analysis (WNA)

The initial analysis that identified the need for the first SPC course had been done prior to the CLCI project as part of the union's ongoing analysis of needs in its training program capacity. They had previously conducted SPC training, but found that participants were not able to transfer the somewhat abstract skills to their work settings. Considering that result and the need for SPC

for the new truck fuel injector program, the EPT decided to relate the SPC training to problem-solving processes with the new truck program's machinery and work system. Thus, they would address a number of SCANS skills (math, teamwork, decision-making, and problem-solving) simultaneously.

After the SPC training and follow-up evaluation were conducted, the union worked with management to determine that training was needed in problem-solving for hourly employees. To assess the needs more specifically, the prospective course teacher developed a draft survey and refined it with the help of the union person in charge of coordinating curriculum. This survey intended to "identify workplace needs resulting from ongoing organizational change .... Identify overall organizational educational needs .... (and) investigate activities that will help employees and organizations fulfill identified needs." It contained 14 questions requiring open-ended responses in such areas as technical changes workers were encountering, training they've had to prepare for the changes, positive and negative features of prior training, implementation of the team concept, workplace adjustments to teamwork, problem-solving experiences in teams, and perceptions of what could be done to move the team and problem-solving components further along.

The management team (supervisors and other mid-level managers) responded to the survey in writing and also made suggestions for its revision before it was distributed to a wider group. The revised version was presented to selected representatives of 30 teams in the targeted area of the plant. Each team selected one representative to be part of one of three focus groups who responded to the revised survey in writing, with a time of discussion afterward to supplement the written survey. The results were then compiled and made available to all members of the 30 teams. Workers indicated that they didn't simply want "another class" which would teach them things they never applied in reality. It was agreed, instead, to structure learning activities as problem-solving teams whose members would identify a problem and use a problem-solving method to analyze and then solve real problems the workers faced. Further discussions identified several technical and communications problems. Using these results, the EPT focused the two problem-solving classes on (a) the TBI700, a test stand, and (b) the 100% CARE program, a new quality containment process. Each class was to further define the problem they would work on within either the TBI700 or the 100% CARE program.

The second round of SPC courses came about as a result of a QS9000 audit, in which inconsistencies were noted in the SPC charts. The auditors were unable to ascertain from the machine operators why the inconsistencies appeared or what the charts meant. It was determined that the inconsistency resulted somewhat from a lack of training in SPC and somewhat from a lack of consistency in the training that did occur.

Instruction

A. SPC

Because SPC was a clear concern, the math instructor devoted special attention to finding ways to make the math instruction relevant. She worked with managers, a quality analyst, engineers, and others on the shop floor to review what kinds of math and communications functions were of particular concern. She found that SPC was needed to help employees keep track of output from the new, precision machines being used to create parts for the fuel injection systems. Each machine produces statistics charted on a graph, which show the numbers of parts produced, and measures of the quality of the product. Workers needed to be able to read those graphs, understand the mean, medium, mode, and range of the statistics, and make decisions based on that understanding. The teacher developed a focused workshop which would help workers understand those math functions. Workers would then practice in groups to make decisions about whether and how corrective action was needed.

For the course structure, three groups of learners met in classes of approximately ten workers each. Most participants were motivated to "clear out the cobwebs and try their hands at" upgrading their SPC skills, which they saw as important. In a typical class, participants worked on their own and in small groups. They focused on the vocabulary, concepts, and math functions contained in the charts. This understanding was necessary to enable them to talk with engineers, to diagnose and solve problems. Learners also developed self-esteem and personal motivation, as well as oral communications and information-finding skills. All of these were considered important for ISO 9000 certification as well as for day-to-day quality operations and preparation for further training.

The SPC math curriculum (called "SPC Training") consisted of two three-hour sessions:

Day 1: Focused on statistics on the MetriStat charts used on the floor.

Day 2: Focused on team-building and problem-solving, using simulations of a PEP team situation to practice making decisions and solving problems shown on the MetriStat charts. (For example, they were given a chart with data in the red zone. They needed to analyze what the problem was and then decide what to do, using flow charts which showed what steps to follow to solve particular problems.)

The problem-solving exercises proved to be very popular and were seen as relevant by learners. Learners were then better at understanding and applying some of the team problem-solving training they had received previously, some of which might have been too complicated,

with too many steps. The teacher relied on input from the EPT to help her develop the flow chart used in these activities. Learners also gave her feedback on the chart, and she revised it as learners got more experience using it.

As an additional support activity, the teacher also oversaw activities at the plant's skills center, which has computer-assisted activities and other services. In that capacity, she provided informal tutoring and counseling to workers to supplement what she did in her math courses.

B. Problem-Solving

Two problem-solving/teamwork courses were conducted in Fall 1996 – Winter 1997 for about 10 participants each for 4 hours per week over 10 plus weeks. The first, the 100% CARE program in the MPFI Rails unit, addressed the problem of ways to decrease the number of rejects to eliminate the need for their existing end-point inspection process. They developed four action plans for solutions:

1. Development of a new cap tool
2. Planning and implementation of a preventive maintenance program
3. Biweekly "huddles" to address awareness of rejects; sources of product problems; line, machine and production schedules; other factors influencing quality
4. Worker rotation schedule.

The second course, on the TBI 700 test stand, addressed two problems: ways to eliminate leakage in the test meter body and ways to improve the implementation of Workplace Organization and Visual Controls. The first problem had been a continuous challenge to Delphi's technical staff for over a year already, and the training team undertook the role of coordinating the fragmented efforts and driving toward a solution, which is not yet in hand. The second problem was adopted to fill in during the down times on the first problem. In response, the team developed a Workplace Organization Action Plan.

In these classes they adapted the "Cornell" approach to problem-solving and a five-step method that General Motors had already developed to lead groups through analyzing problems. The groups came up with a series of recommendations for solving those problems, while also developing particular skills like calculating costs, graphing, and mapping out responsibilities and problem-solving procedures for individuals and departments.

The teacher gradually turned the running of class activities -- flipcharting, taking minutes, etc. -- over to team members. This was a way to let them practice the "basics" of team decision-making while also preparing an action plan.

A significant feature of the problem-solving classes seemed to be that management and engineers were integrally involved in planning the courses and, to some extent, in interacting with the trainees during the courses. Some met with teams on occasion to discuss their respective positions and considerations, informing the teams of thinking or activity already in progress on the tasks at hand or posing additional difficulties to consider in the problem-solving process. Thus, the work of the teams had a more sound context than it would have had otherwise and could stay directed in line with broader company efforts and needs.

Results

The results of the workplace education programs at Delphi are examined in three areas: the workers, the workplace and the business/union commitment to worker education. The results from the first round of SPC classes were assessed by the course instructor on a set of rubrics for the course's 83 specific objectives. From the assessments on those rubrics, the students were rated at a 3 or 4 level (on a 4-point scale, with 4 the highest) on 82 of the 83 objectives. Anecdotal reports of worker and workplace outcomes a few months after the courses include:

1. The participants understand their SPC charts on the job much better than before the course.
2. They use the charts to solve quality problems.
3. The engineers report that machine operators talk to them much more as a result.
4. Better morale is reported by operators and observed by managers and team leaders.
5. More initiative is taken by operators to identify and attempt to solve problems.
6. Their communications include an active concern for quality in comparison with the past.

To assess the workplace impacts, management tracked the scrap rates of this new line and that of a comparison group that received only OJT. This SPC/problem-solving trained group had 461 percent fewer rejects than the comparison group did over the 6-month period following the training. Additionally, the company budgeted a certain number of dollars for scrap based on historic data for this type of product. That budgeted amount was 514 percent more than the grant-trained team's actual scrap cost. No other changes or circumstances are known to have influenced this effect.

The results from the second round of SPC/problem-solving courses were assessed by teacher-made performance assessments on constructing and interpreting SPC charts. These assessments demonstrated that 90 percent of the participants could compute the mean and range of given data, accurately complete SPC charts in their specific work areas, explain terminology associated with the charts, and explain trends in them. In external evaluator interviews, class participants indicated that they learned what the "action codes" (actions to take for out-of-control processes) meant. Before the class, if the worker didn't know what to do when the process was out of control, s/he would let it pass, allow the machine to shut down automatically, or call a supervisor. Since the class, workers have learned to read the codes and take the appropriate action -- such actions as taking a resample, studying the data to define the problem better, determining whether the problem was a tool or an incoming part, where in the process the problem occurred, etc. They also learned how to plot the data so they could determine in advance if there was a tendency that might go out of control and, if so, adjust the process beforehand.

In the workplace itself, communication about the charts and action codes among team members has increased to improve the accuracy and quality of both the charts and the communications. Additionally, the operators initiated changes in the charts to increase their usability, such as enlarging them and increasing the numbers of blank lines on them. These changes led to greater consistency in completing and reading the charts and less wasted time trying to decipher what individuals had written on the charts.

The problem-solving classes produced results, but not necessarily the solutions proposed by the team members as intended. First, the employees demonstrated in course assessments and in external evaluator interviews that they learned to solve problems in more systematic and comprehensive ways than they could before. They gained skills in structuring their work as groups -- by preparing and following agendas, keeping minutes, and preparing reports on tasks. They also built confidence in their abilities to (1) use those skills on the job, (2) interact with management and engineers, both informally and in formal meeting presentations, and (3) make contact with appropriate resource persons. They reported learning more about how to work well within a group to solve a problem, the value of seeking consensus, and how potential solutions are enriched by a group working with the input of all members.

Second, for the workplace itself, each of the two groups produced a number of proposed "solutions" to their problems, described in the Instruction section above. No solution was implemented as articulated by the classes. Most had to await further management or engineering review for the few months following their presentation. Additionally, just prior to their presentations, the general superintendent, who was a strong advocate of this training and a lead person on the EPT and course development team, left the position. The personnel change

delayed follow-up on the teams' proposals. One of the solutions, for the new cap tool in MPFI Rails, addressed a problem that the tool manufacturer was addressing with a new prototype, still at the test stage during the class duration and, therefore, out of the team members' or management's control.

Participation in the team-building and problem-solving and communication processes of the course yielded some positive results as adaptations of the originally proposed solutions. One team member followed up on the need identified for more communications among work cell members by instituting a question and answer form and coordinating it with the electronic bulletin board for communications between hourly and salaried employees. This is reported to have increased communications between the two groups. Another team member, since transferred to a new work unit, was designated by her supervisor as the informal trainer in the cell for problem-solving processes, using the skills learned and practiced in the course.

Delphi's business and union commitment to worker education was very high before the CLCI project and continues to be so. That the union has the responsibility for worker training built into their contract with Delphi reflects the importance of worker education. They take this role especially seriously for two chief reasons. First, they wish to insure that employees have the skills to be marketable if anything should happen to this plant. Second, better skills among this plant's workers give them a competitive advantage over other GM plants which can in turn help them weather budget tightening and resulting workforce or training reductions that periodically occur. The union especially sees that the courses offered through CLCI, with their problem-solving focus, direct job applications in the instruction, and worker empowerment, helped to demonstrate some examples of what they would like and need to do in training and work processes across the plant. These examples need to be accepted and implemented on a much wider scale, however, and this project's activities are seen as an important early step in that direction.

Main Lessons from Delphi Project

There are at least three striking features of the Delphi project. One, the union's active leadership role in training programs was in some ways a double-edged sword. On the one hand the project did not have to start from the beginning to conduct a major WNA. The union had an ongoing semi-formal assessment of needs, so that there was a clear sense of a training need that the CLCI program could almost immediately address -- namely, the SPC courses for the new truck fuel injector program. On the other hand, as realized during the initial training, management was not integrally involved in the training. The newly trained workers' dramatically increased SPC skills opened avenues for new ways of working that engineers and

managers had not expected -- namely, the operators became more active initiative takers in solving problems and in communicating well with SPC-related information. This created, in that production unit, some degree of role confusion and friction, which required both social and technical adjustment to resolve. The resolution at the overall training program and organizational level was that managers were more integrally and continuously involved in planning and conducting the next round of WNA activities and in the training.

Two, the SPC courses were combined with problem-solving, teamwork and the computer assisted formats on which learners could practice in the skills center. This required special curriculum development and considerable effort on the teacher's part. The payoff, however, was great. The learners could practice skills in private and at their own initiative in the skills center, thus reinforcing their taking their own initiative for learning. Also, they found the SPC technical learning transferred to real usability on the floor and associated satisfaction and positive morale. Additionally, the work processes improved, sometimes dramatically.

Three, likely as a result of management's substantial involvement in helping define the needs for training in the problem-solving courses and interacting with the problem-solving trainees during their courses, the problems selected for intensive work were important ones to the company. The down side of this was that the problems may have been so large that they may not have been the best examples for training applications, at least for participants' initial training in problem-solving.

Another feature of management's involvement was that a fairly high-level manager advocated for moving toward a participatory problem-solving approach and management practices to support that approach. Unfortunately, he left his position before the changes were made permanent. When he left, existing culture and management practices remained in place, and the pockets of resistance, which generally exist in a changing environment, inhibited forward movement of the teams' efforts.

EG&G Wright Components and Wayne-Finger Lakes BOCES

Overview

EG&G Wright Components is a manufacturer of flow valves for the aerospace industry. Located in Phelps, New York, southeast of Rochester, Wright Components has employed from about 70 people near the start of this project to about 115 near the end, including engineers, drafters, machinists, assemblers and chemists, in addition to management and support staff. The Collaborative Learning for Continuous Improvement (CLCI) program offered eight courses, five in problem-solving and communications, two in computer skills, and one in Geometric Dimensioning and Tolerancing. Approximately 95 employees participated in at least one course during 1,021 hours of contact time, all on company time for an estimated cost of $14,505 to the company.

The primary goals at the project's outset were for employees to develop:

1. effective communication skills necessary to process orders according to customer expectations
2. appropriate documentation skills
3. competencies in departments other than their own
4. problem-solving strategies to use on the job
5. basic skills necessary to participate in corporate training programs.

Through its first round of problem-solving and communications courses, the company has seen improved listening skills, communications in team settings, speaking, accessing and formally presenting information, confidence in speaking and interacting with leadership, personal work organization, and workflow processes, a significant reduction in cycle time, and significant increase in early or on-time customer shipments. Moreover, the corporate group member responsible for company-wide continuous improvement indicated that this means of workplace education would be the chief means for the future and that the training teams' "solutions" were "exactly what was needed to foster continuous improvement" at the company.

Business Context

Wright Components is a subsidiary of EG&G, Inc., of Wellesley, MA, a world-wide research, manufacturing and services firm involved in four major operational areas: technical

services, instruments, mechanical components, and optoelectronics. The entire company and its markets have been tighter in the past few years, largely because of U.S. Department of Defense cutbacks with resulting decreases in EG&G contracts, and also because of a general market trend of customers seeking shorter lead times on delivery, which competitors could provide. Among other strategies for growth in this market, the company sought and obtained other private industry markets during the course of this three-year project for its current and emerging products. It did so with the goal of more than doubling its sales from its 1994 to 2000 levels.

One impact on employees has been that Wright Components has been hiring new employees in the past few years, but are now more particular about the quality of employees. Other than the professional management staff and a few engineers, most floor employees have high school diplomas, though a few have some college education or bachelor's degrees.

Wright has had difficulty finding new hires with the competencies desired. They restructured the work near the outset of this project to reduce the middle management levels and train floor employees within functional work unit "cells" (e.g., machining, cleaning, coils, packing, etc.) in a variety of skills and cell functions. The plant uses teams to a high degree, with Team Leaders in each work cell and a Leaders Team, consisting of the Team Leaders and central management. Given the company's commitment to team structure and Total Quality Management, promoted strongly from "corporate," a workplace basic skills education program utilizing the representative team concept at its core fit well into Wright Components' culture. Moreover, the problem-posing curriculum framework was used extensively by this project and fit the managerial and operational structure of the company well, given its high level of TQM and team activities.

Another change that impacted employees has been that of a major corporate restructuring about two years into this project. This restructuring involved changing the teams from the cell structure described above to product-line teams (aircraft turbine, allied signal, aerospace) and shifting to the front-line workers such administrative functions as inventory, ordering and interpreting planning specifications. These additional changes drew heavily on the teamwork, problem-solving, and communications skills taught through CLCI in the first half of the project and expanded later through Just In Time training, and facilitator and team-building training by outside consultants. The additional changes also, along with the rapid increase in new hiring, instigated the reestablishment of a journeyman's program in machine trades. Finally, for about a

five-month period during these changes, the CLCI project was put on hold to assess the best ways for it to fit into the new plant structures and employee roles.

Educational Partner

The Wayne-Finger Lakes BOCES serves New York's east central region for a variety of adult services, including workplace education, and vocational programs to in-school youth. The BOCES provided two part-time staff for the Wright project, one as overall administrator and one as the day-to-day coordinator and primary curriculum developer and instructor for the classes. The BOCES has also donated classroom space and associated materials, since the workers go to the BOCES for their classes.

The Partnership

This partnership between the Wayne-Finger Lakes BOCES and Wright Components was initiated for this project. There was little, if any, problem setting up the basic partnership activities such as the EPT representation and functioning, management support of classes, participant released time, and collaboration on decisions. Moreover, those functions have continued to progress well, with apparently mutual support between the partners.

The Educational Planning Team (EPT)

The EPT met at least monthly for most of the first two years of the project, more frequently during especially busy periods. For example, from the fourth through eighth months, they met 23 times. When it began in 1995, the EPT was composed of the education partner's administrator and coordinator/teacher, the company's Human Resources Manager, and representatives of various departments. Over time, the make-up shifted to include more representatives of higher-level management, including the managers of the business unit (i.e., the plant manager), the quality unit, and the purchasing unit. The coordinator believed this was due to the recognition that the EPT was adding value to plant operations, an efficient way of identifying and responding to priority needs in the plant. Two of the problem-solving classes' "solutions," implemented by management, were concrete results of the initial communications course and were seen by management as concrete, useful products of the EPT and the program overall.

The EPT operated with rather formal procedures, each meeting having a formal, written agenda with a written record of the main points, decisions/conclusions, and next steps for each agenda item. The meetings also had an assigned facilitator, recorder and timekeeper, each on a rotating basis. During less active training times, most notably for the five months after the second corporate restructuring described above, the EPT met infrequently, although the education partner personnel met informally with key EPT members to check on the situation and assess when they might be able to move again and what activities would be appropriate.

The meeting content initially included transmitting information about the project's purposes and the EPT's responsibilities, and establishing the group's operational procedures. A review of the agendas indicates, however, that, after this initial foundation work, a majority of the items included decision making and planning of such activities as: the workplace needs analysis; development, conduct and analysis of needs assessment and course evaluation instruments; curriculum plans, including critiques of their draft versions and revisions; ideas on how to "market" upcoming classes to employees; and progress analysis on the implementation of learning or products from prior classes. Some of the topics taken up by the EPT required member activities outside the meetings -- activities such as drafting survey or evaluation instruments or curriculum plans, gathering initial reactions to draft instruments and class outlines or lesson plans, or informally assessing logistical information needed to conduct surveys or plan classes.

The Workplace Needs Analysis (WNA)

To initiate the analysis of workplace training needs through this project, the EPT began simply brainstorming its own statements of needs. These brainstorming results were sorted for similarities, differences, categories, clarification, and initial prioritization. The initial list of needs included work-specific technical skills such as drafting, machining, special processes, finishes, and tool geometry. It also included more areas such as managing change in the plant, writing memos about work processes, basic skills for machinists, time scheduling, costing and planning, and paperwork reduction. A third category included communications skills such as grammar and spelling in written communications, computer operation and software skills, team building and problem-solving.

The EPT prioritized the areas it wished to look at more systematically. Some areas were targeted for training by other vendors or by internal technical specialists. Some were really not amenable to training so much as they were to operational changes (e.g., paperwork reduction).

For the communications, computer, team-building and problem-solving skills, they developed survey instruments to be given to all employees. The instruments involved both written responses and interviews with some employees. The interviews collected information not only on specific skill needs as perceived by employees, but also on more general job context information such as how their jobs have changed over time, what kinds of training they'd received and how helpful it was, descriptions of key problems on the job and how they are handled, equipment and organizational situations that need to be changed, the quality of communications within the company, and the kinds of training structures and motivations that need to be established to make training effective.

The results of the surveys and the EPT's deliberations about them led to the conclusion that the most effective training on a number of high-priority need areas would be through problem-solving classes focusing on improving communications in work processes. These classes and this part of the program would be called *Strategies for Success (SFS)*. Each class would constitute a team which would identify its own problem concerning communications in the workplace, work to develop and attempt to implement "solutions" to that problem, and learn the more traditional basic skills needed to develop and implement those solutions.

A little over a year into the project and after the initial round of the *SFS* classes, which were very successful in impacting work processes (to be detailed below), the EPT turned its attention to the second priority need the CLCI could address -- computer skills. Just at about the time the *SFS* classes ended and their products were being implemented or considered by management, the company initiated a sweeping "computerization" of all work processes. EGG announced the large-scale purchase of computers for each workstation, networked both within Wright Components and across all of EGG. Thus, the EPT moved with haste to refine its needs analysis for computer skills so that its training could be most effective and timely for this new operational move. They repeated the process from earlier, focusing specifically on computer skills this time. They brainstormed a list of potential computer skills, developed a survey instrument, revised it, and administered it to all floor employees, assessing skills in which people felt they most needed training. The result was the generation of the following topics on which to

develop the curriculum for this part of the program: computer terminology, different parts and functions of a computer, basic use and care of the equipment, mouse skills, keyboarding skills, and an introduction to software applications. Out of this outline, the more complete curriculum was developed and implemented during the summer and fall of 1996.

Instruction

For CLCI, there were three types of classes. The first series, *Strategies for Success*, was constituted around four teams of four to eight people each working on problem-solving and communications skills. In each group the project attempted to mix employees from different departments (engineering, drafting, assembly, machine shop, testing, and inspection/shipping) and levels (upper level leaders, floor managers, and floor workers). These classes were structured for two-and-a-half hours per week over a four- to six-week period during September to November 1995. In the second, *Computer Skills for Procedural Documentation*, two classes of 15 employees met for 17 ½ hours over five weeks. All classes were held away from the plant at the BOCES facilities in order to avoid the distractions and interruptions that would otherwise have occurred during the work shifts at the plant, a feature which highlights the importance placed on this program by the company. All of the class participants were floor workers. The third, *Geometric Dimensioning and Tolerancing (GD&T)*, was held during the last few months of CLCI.

To further clarify learning needs and analyze the workplace, the teacher asked each group to do an illustration which portrayed their workplace. One group portrayed the company as an aircraft named the "SS Wright Products," which was flying high but having to evade various kinds of "missiles" (corporate challenges) which were trying to shoot it down. Another group portrayed a mouse in a maze, trying to find its way through unknowns and other challenges. In another activity, learners were asked to take three questions back to the workplace, asking co-workers about work-related needs, goals, and obstacles. Through such interactions with learners, the teacher identified areas where productivity and communications might be blocked and possible areas for process improvement. From these investigations, she identified a number of possible goals and projects for each class. The groups also recognized concretely that there are various ways of interpreting the workplace and needed improvements, and that there is a value in getting input from a variety of perspectives and individuals.

The workers were involved directly and completely in determining the topic for instruction in the *SFS* classes in that one of their first tasks was to define a problem on which they would focus and try to "solve" as the key objective of the class. The "problems" selected by the four groups, along with their "solutions" or results and implementation status, are shown in the following table.

Team	Problem	Solution/Result	Implementation Status
1	Develop a visible and useful job-tracking system to overcome bottlenecks	White board system with color-coded progress information cards	trial use in one department, expanded to use in all departments
2	Not enough trained personnel in machine shop, can't keep up with production deadlines and maintain product quality standards	Plan to cross-train new machinists	space & time problems; on hold; not top priority by management; seeking more specialized machine skills training from BOCES
3	Better cooperation and communication across departments	Map of coil assembly process; rate levels of assistance needed at each step of process; plan for cross-training in process	made presentation to Leaders' Team; put on hold since priority given to prior implementation of teams 1 & 4 solutions
4	Better communicate across shifts problems detected during production	Process Improvement Form (PIF) to identify, document and track problems and solutions	implemented in two departments; engineers using to analyze trends in problems and work toward design solutions

The instructor's main functions were as: 1) a presenter of a problem-solving process, 2) a facilitator of the group working through that process, 3) an advisor to identify means by which the participants could obtain information they needed to complete their tasks, and 4) as a subject matter expert to identify communications improvements needed in working out the problems' solutions. The latter often involved conducting informal instruction in grammar, spelling, oral and written style and expression, and speaking and listening skills. To aid in that process she kept a portfolio of the team and individual products for each class, reviewing it after each session to pinpoint additional skills needed for continued work in both the problem-solving and communications areas.

As they developed their action plans, participants were expected to go out on the floor and present the team's draft recommendations to three co-workers. Learners noted the co-

workers' responses and brought them back to the group. The group in turn incorporated those responses into their final presentations.

The culmination of each team's class activity was a formal presentation of their work and proposed solution to the Leaders Team. These presentations were formalized with hard copy materials and overhead transparencies, and each team member made at least part of the formal oral presentation. The formal speaking opportunities and subsequent interactions with management to discuss the presentations were first-time events for most participants, and thus the communications' skill development was significant for most of them to be able to conduct such an activity. The leadership team considered the plans, then asked the groups to be more specific about costs of their recommended actions. The teacher subsequently worked with some of the groups to develop budgets.

The Computer Skills for Procedural Documentation classes focused on developing needed computer skills to prepare workers to use a computerized inventory and ordering system that the company was preparing to, and subsequently did, implement. The workers were from the machine shop, assembly and clean room cells. The content included a basic introduction to the use of the computer, reading and keying in instructions related to each worker's machine, and the movement of parts and products through the manufacturing process stages. The course was done as a direct preparation for, and was linked to, the next stage of company training on its computer network system. The CLCI part focused on keyboard use, opening and closing files, terminology, and some word processing and spreadsheet applications. Those employees who needed the training but were unable to participate were trained informally on the floor by the trained workers. An additional and very important feature of this course was that a handful of managers also participated in the training so that they could see what the front-line workers were learning and could understand the new skills the workers would bring to their jobs. The managers were also given copies of the teacher's recommendations for follow-up support needed by individuals so that they could provide additional customized training as needed.

The Results

The first set of results includes the project's own internal evaluation of the extent to which they've attained their initial goals. For each goal presented at the outset the EPT generated several indicators. Their results on the highest priority indicators related to the *SFS* courses are

as follows. From judgments by the instructor in the classes and by the team leaders on the job, a significant number of the workforce demonstrated understanding of the problem-solving model and could articulate its steps and apply them to job situations. They accurately identified the various components of their plant's manufacturing process, including areas other than their own. The team leaders reported more employee awareness of customer specifications for given jobs and reduction or elimination of previously recurring errors. Additionally, as the participants' efforts were recognized by management, and in some cases incorporated into the work system, employees' perceived value in learning and self-esteem were judged to have increased.

For those indicators related to the computer skills courses, a written survey at the end of the courses indicated that the participating employees felt they had learned from the classes, though they wished they could have extended the training further, perhaps in a lab context to get more practice. The instructor's judgement was that they had a good grasp of what was covered. Further, the individuals the teacher thought still needed improvement in specific skills agreed that they did. The employees immediately began using these skills on the floor once the new computer system was up, sending e-mail messages, writing in full paragraphs, pulling up work orders for themselves, and reading job specifications rather than asking planners for the details. The use of e-mail was noted by both management and employees as being significant in improving communications because more information now is communicated. That is, before, if someone on the floor wanted to get information to, or ask a question of, a person in another cell or in management and they had to stop work to physically seek the person or if that person was not available, they would often let the communication slip by. Now they just e-mail the person and the information is communicated.

The second set of results addresses the statewide goals of demonstrated impact on workers, the workplace, and the business commitment to worker education. These results were derived from the project's survey two months after the *SFS* and the Computer Skills courses, external evaluator interviews with employee participants and with the instructor and management personnel, and from production data records. The survey and the interviews indicated substantial improvement among participants in their listening and speaking skills, communications within teams, ability to access and clearly present information, confidence in speaking to and interacting with leaders, and improved organizational abilities of individuals.

Effects on the workplace appear, from early data, to be significant. First, the managers report that the overall workflow processes have improved noticeably with the utilization of the Process Improvement Forms, the product of one team's *SFS* class. The employees themselves report that with their new computer skills they can use their new computer workstations to directly assess parts inventory and order their own parts; since don't have to go through a third party, their access to parts needed is faster and more accurate. They can now batch jobs together when they know how to order parts in relation to all their upcoming jobs, thus making their machining more efficient. The machinists can access drawings on their own by computer and check the design, correcting errors more quickly and efficiently. They can enter their inspection data directly, without waiting for an engineer or planner to do so, making that part of production faster and more accurate. Additionally, the employees, during the follow-up external evaluator interviews, indicated that these changes gave them a sense of more complete responsibility for their jobs and that was good.

Second, tracking of cycle time and early or on-time shipments for periods before and after the introduction of the PIFs and the white board system from the *SFS* classes showed substantial positive impacts. Those results are detailed in Tables and Figures 2 and 3.

The data in Table and Figure 2 indicate "thru-put" (the number of workdays per product, the company's term for cycle time), showing deviations from the average over the 16-month period.[1] The figures indicate a marked trend of decreased thru-put (cycle time) in workdays immediately after the April 1996 implementation of the *SFS*-suggested PIFs and white boards. Notice that the total figures across all three plant units (M, C, and A/T) were above average (positive deviations) for the three months before April 1996 and were far below average (negative deviations) for each month after that point.

Examination of the customer shipments that were early or on time before and after April 1996, shown in Table and Figure 3, reveals the same trend through October 1996. For five of the seven months before April, the early/on-time shipments were below the average for the period, while they were above the average for six months after April. They then dropped slightly below or about at the average level for December 1996 through May 1997. It was during this latter

[1] These were transformed from the original figures to mask the company's original proprietary data.

Table 2. Thru-Put in Workdays, Deviations from Average

Plant Unit	Jan 96	Feb 96	Mar 96	Apr 96	May 96	Jun 96	July 96	Aug 96	Sep 96	Oct 96	Nov 96	Dec 96	Jan 97	Feb 97	Mar 97	Apr 97
M	6.63	1.63	7.63	**3.63**	-1.38	-3.38	-7.38	-7.38	-8.38	-11.38	-12.38	-9.38	**-9.38**	-13.38	-13.38	-10.38
C	7.38	2.38	8.38	**1.38**	-3.63	-5.63	-5.63	-4.63	-6.63	-4.63	-5.63	-3.63	**-5.63**	-4.63	-4.63	-6.63
A/T	5.25	6.25	-3.75	**14.25**	-4.75	-8.75	-1.75	-6.75	-2.75	-5.75	1.25	0.25	**-1.75**	-4.75	-5.75	-3.75
Total	19.25	10.25	12.25	**19.25**	-9.75	-17.75	-14.75	-18.75	-17.75	-21.75	-16.75	-12.75	**-16.75**	-22.75	-23.75	-20.75

Figure 2. Total Thru-Put in Workdays, Deviations from Average

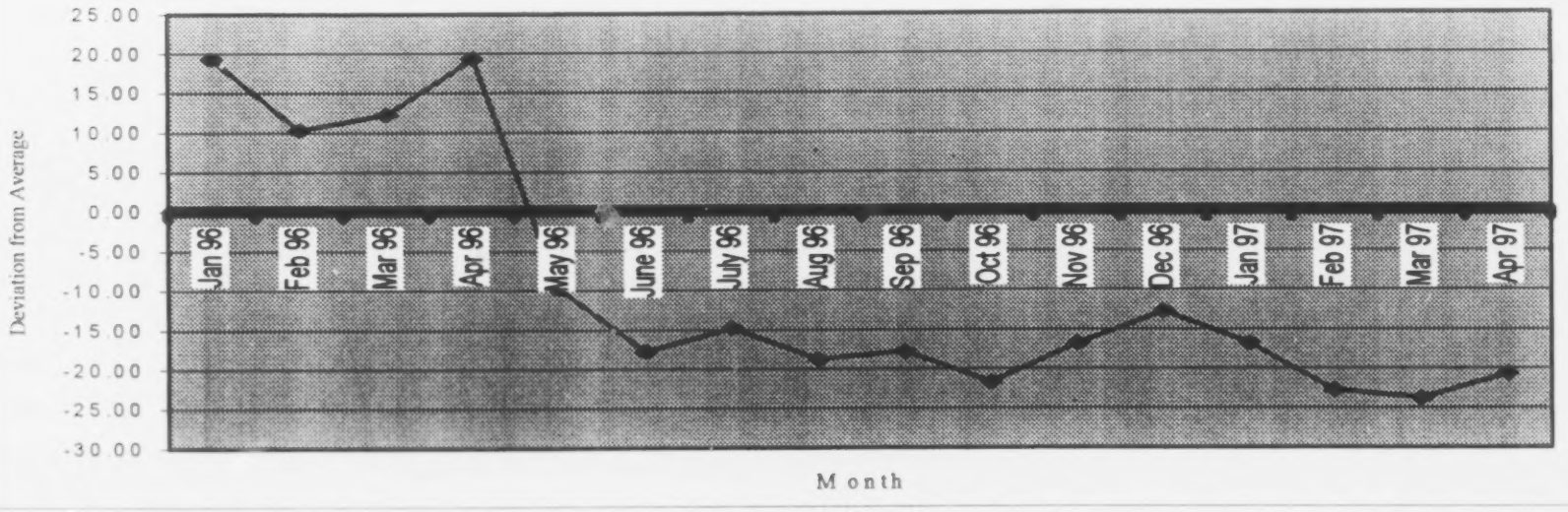

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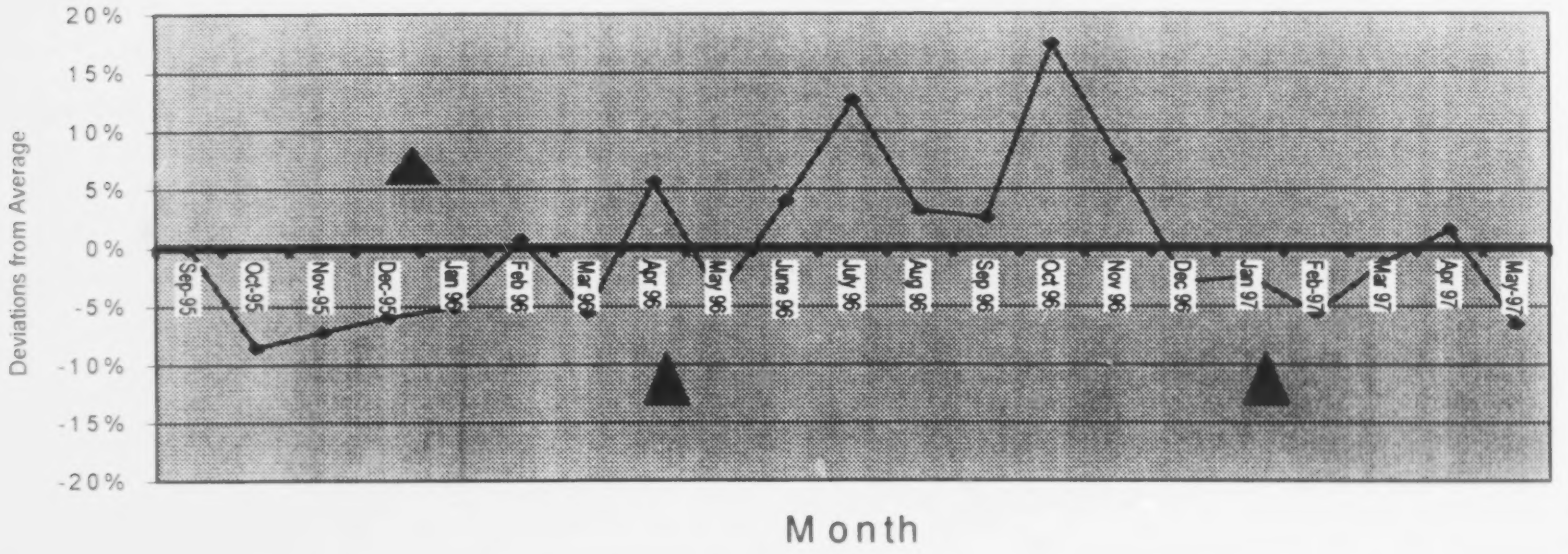
Table 3. Percent of Customer Shipments Early or On-Time, Deviations from Average																			
Sep-95	Oct-95	Nov-95	Dec-95	Jan 96	Feb 96	Mar 96	**Apr 96**	May 96	June 96	July 96	Aug 96	Sep 96	Oct 96	Nov 96	Dec 96	**Jan 97**	Feb-97	Mar 97	Apr 97	May-97
0%	-9%	-7%	-6%	-5%	+1%	-6%	**+6%**	-4%	+4%	+13%	+3%	+3%	+17%	+8%	-3%	**-3%**	-6%	-1%	+1%	-6%

Figure 3. Percent of Customer Shipments Early or On-Time, Deviations from Average



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six-month period that the numbers of orders grew tremendously at the plant and the second corporate reorganization of the CLCI period took place. Thus, it appears that both events put the plant in a situation where they received more orders than they could fill on-time with existing personnel and systems, both of which they were in the process of adjusting from January 1997 on.

Both sets of results for Wright Components show a long-term trend strongly suggesting that the intervention of the PIFs and the white board system that grew out of the federal grant's problem-solving/ communications classes had a positive impact on the plant's production at this company. When the other major events that might have affected these results are considered, they seemed to have little, if any, impact. One other major event was the purchase of capital equipment (3 of 10 major machines were obtained from April through June 1996). Another event was that some machinists received training in basic machine tool skills at the local BOCES over the course of the past year. The machine tool training, however, was taken by seven of 19 machinists and is not an unusual event; it is taken as needed by skilled people in the plant on a fairly regular basis.

With respect to the business's commitment to workplace education, both Wright Components and EGG seem committed to the use of a stakeholder-based participatory model of planning and governing workplace education and the use of teams in problem-solving as an instructional paradigm. A member of EGG's management team, commenting on the results at Wright Components, stated that the training teams' "solutions" were "exactly what was needed to foster continuous improvement" at the company. As the company went through its second major restructuring during the CLCI period, described earlier, it used the problem-solving methods from the *SFS* courses for its Just In Time training.

Main Lessons from Wright Components' Project

One of the most striking features of the project at Wright Components might be characterized as the seamlessness of the partnership and the ways in which the CLCI model fit into the company's organization and culture at the time. At about the time of the project's onset the parent company had initiated a major effort at restructuring, emphasizing hierarchical flattening and team operations. Supervisors were mostly eliminated, with Team Leaders coordinating operations within each departmental "cell." The Team Leaders and central

management became the Leaders' Team with a high degree of participatory authority over plant operations. In addition, all employees had undergone training and an operational transition to teamwork. Thus, employees were at the cusp of working in teams, interacting more directly with management, and becoming involved in problem identification, analysis and solving. This workplace education program came in with the same orientation and so fit in well with the evolving culture. As a result, the more technical or logistical aspects of the CLCI model, such as governance by stakeholder-based EPT, conducting a broad-based Workplace Needs Analysis, implementing the problem-posing curriculum, and giving resources to serious evaluation, posed no special difficulties.

The foundation thus laid in the plant was also capitalized on by the education program to create a lively and productive partnership between the BOCES and the business. The program's instructor sat in on some of the corporate training to become more familiar with the direction the company was going and the other training content and methods to which the employees were exposed. The Wright Components Human Resources Manager became very much a co-director of the education program with the BOCES administrator, giving considerable time and priority to this project's activities. Constant communication among all parties seems to have taken place. That foundation was further developed and reinforced by the apparent success of the *SFS* classes in developing viable improvements in plant operations, which in turn probably increased the value the plant personnel placed on the education program.

Another strong feature of the project at Wright Components was the broad-based WNA. While the project spent most of the first year addressing the top-priority training need through the *SFS* courses, it was also poised to address the second priority need, that of computer skills, when the company's efforts turned sharply in that direction. If it were done again, however, the program coordinator indicated that, due to time constraints, she might do more focus groups and fewer one-to-one interviews. She might also use pencil/paper or electronic questionnaires, where feasible. She also emphasized that trust is vital if informants are going to give accurate, truthful feedback in a WNA. This trust can be increased by having the coordinator do an advance explanation to employees of the purposes and guidelines for the WNA before embarking on it.

A number of very practical positive features were present in the CLCI project at Wright Components. These might be considered other factors that ensured success. They included:

- A new manager who showed real interest in the program (e.g., writing letters of encouragement to participants).

- An EPT which encouraged all key stakeholders to participate in goal-setting, in the classes, etc.

- A Leaders Team which bought into the problem-solving curriculum model, paid attention to the groups' reports, etc.

- Integrating practice in SCANS competencies with actual problem-solving activities that focus on real, important workplace problems.

- Opening the program to all employees, but not mandating that anyone participate.

- Encouraging employees to "stretch" themselves but respecting that some might not feel confident to take on roles (e.g., public speaking) they weren't accustomed to.

- The company's providing release time to enable workers to participate, and the company's willingness to expand the number of class sessions as needed.

- Having participants go out on the shop floor to get input from co-workers. This not only ensured that group recommendations were relevant to workers on the floor but facilitated understanding and buy-in from workers.

- Allowing workers to select their own problems to focus on and respecting their insights and experience in the problem-solving process.

- Mixing participants of different organizational levels and departments in the same group, while respecting the limitations and strengths of individuals.

Eastman Kodak Corporation and Rochester City Schools

Overview

This project operates in Kodak's Precision Components Manufacturing Division (PCMD) through a partnership between Kodak's Workplace Education Initiative and the Rochester City Schools Adult Education Department. The PCMD has employed about 650 people during the period of this project. The Collaborative Learning for Continuous Improvement (CLCI) program offered 25 classes, 14 in problem-solving and 11 in customized basic skill areas of reading and writing, math, and learning strategies. Approximately 287 employees participated in at least one course during 11,354 hours of contact time, all on company time for an estimated cost of $439,968 to Kodak.

The primary goals at the project's outset, one for each key stakeholder (noted in parentheses) were:

1. Transfer learning from this project to other Kodak business units (Kodak Education Development Center)
2. Create a mindset of problem-solvers and process-improvers (PCMD management)
3 Improve workers' SCANS skills (employees)
4. Improve workplace education teaching techniques (instructors).

Results of the problem-solving classes on the workers include numerous anecdotal reports of widespread improvements in skills of problem-solving, teamwork and group process, leadership and initiative-taking on the floor and with management. Employee participants also indicate improved feelings of understanding and empowerment within the organization and increased attention to quality on their work lines. Numerous significant changes in the various work units' work processes, organization, or equipment were developed and implemented through the "solutions" that the problem-solving classes developed, some of which were estimated to have significant returns on the training and other related investments. Finally, an additional significant outcome of the problem-solving courses was that many participants reported that through the courses they became more pointedly aware that their math, reading or writing skills were not as good as they needed to be and they requested additional help in these areas. The program responded by developing and conducting the customized basic skills courses.

Business Context

Kodak has for several years been making a transition to a team-based, "high performance" organizational model. The CEO had, shortly before the outset of this project, placed increased emphasis on employee training. The CLCI model was seen as a vehicle for helping the company move forward in pursuing those interests. Additionally, the Kodak Education Development Center, the unit responsible for coordinating corporate training, had adapted the "Cornell model" of workplace problem-solving to its own intended uses, providing a framework for further implementing the problem-solving and teamwork curriculum. This framework was consistent with the CLCI vision and thus formed a fertile ground for relatively quick and efficient program growth.

Educational Partner

The Rochester City Schools (RCS) adult education department has provided workplace education in the greater Rochester area for several years before this project began. During the period of this project, they provided four part-time teachers for the classes in this project, as well as coordination, needs analysis and curriculum development functions.

The Partnership

This partnership between RCS and Kodak existed for six years before the CLCI. There appeared to be an ongoing smooth partnership operation in such activities as the EPT representation and functioning, management support of classes, participant release time, and collaboration on decisions. Those functions have continued to progress well, with mutual support between the partners.

The Educational Planning Team (EPT)

The EPT generally met every two weeks for most of the first year of the project to develop the program goals, acquaint all parties with the CLCI project, plan and conduct the Workplace Needs Analysis, develop a more detailed plan and curriculum, and assign responsibilities and tasks to members. The participants included the Workplace Education Initiative leader, three PCMD Training Advisors (who were production managers of the Plastics,

Metals and Specialty areas), the four RCS teachers, floor operators (on a rotating basis), a Human Resources representative, and a Quality Improvement Facilitator. The regular participation of the floor operators, middle management and Human Resource representatives was difficult. Once the first round of problem-solving classes was completed, the EPT held meetings more frequently as they planned new training cycles. The EPT operated with quite formal procedures, using written agendas, documenting main points, decisions and assignments, and generating written reports or working documents on the more substantive items such as needs analysis progress or results and curriculum outlines.

The Workplace Needs Analysis (WNA)

The WNA was extensive and formally conducted with both focus groups and written surveys, and with considerable content analysis of results. The first stage of the WNA was a series of focus groups with representatives of all work teams and management, conducted by the Kodak and RCS education staff and the Training Advisors from among the EPT members. In these focus groups they gathered general comments about perceived needs and concerns at the general organizational level in PCMD, how well current training programs were addressing those needs and concerns, and their assessments of their current skills and abilities to work well within the "new" organization.

Next the EPT compiled a list of all statements made by stakeholder group and used them to construct a written survey. For the third stage, this written survey was administered to over 300 employees in a cross-section of the production areas. The analysis of these results was then considered in conjunction with the more in-depth focus group results and a set of prioritized needs was developed by the EPT. These need areas included:

- roles of teams in the business units and individuals on the teams; confusion about information exchange, decision boundaries and expectations; teamwork skills and cross-team communication and cooperation;
- concerns about the current performance assessment and compensation system;
- inadequate understanding of technical and quality tools and decision processes; and
- technical skill needs to implement new manufacturing processes, especially those involving the use of computers on machinery.

The EPT decided that the first need area listed above was the one most widespread and fit best into the corporate directions. As a result, they developed a plan to conduct their initial training in team processes, with the problem-solving model as the content through which they would build teamwork and communications skills. Moreover, all workers had previously been given a one-day overview of Kodak's problem-solving process at a remote site. Employee comments during the WNA indicated, however, that the prior "training" was too abstract and academic and, consequently, was not understood well and certainly not applied in their actual work as it was intended to be. Therefore, the plan was to train intact work teams, having each team define a problem from their work situation and develop solutions they could implement.

One of the outcomes of the teamwork/problem-solving courses, to be further described below, led into another needs analysis. In those courses, some participants became aware of their individual needs in the conventional "basic skills." The teachers developed a self-assessment and administered it to participants near the beginning and at the end of the team/problem-solving courses. The result was that the students' assessments of their math, reading and writing skills were lower at the end of the team/problem-solving course than at the beginning. Teachers took this to reflect a greater awareness of needs in those basic skills, which stimulated the EPT to provide the customized basic skills courses offered after the end of the first round of the team/problem-solving courses.

Instruction

Fourteen intact work teams totaling 203 employees, covering a range of shifts and three production areas in PCMD, went through the teamwork/problem-solving training "courses." These courses met for 4 hours per week over a 10-week period. They followed the series of steps in Kodak's formal problem-solving process, adapted from the "Cornell model":

1. Problem Identification
2. Problem Analysis
3. Develop Solutions
4. Select the Best Workable Solution
5. Develop an Action Plan for and Implement the Solution
6. Evaluate the Solution

While learning about and implementing this problem-solving process, the instructor facilitated the group in team and group process skills as well as the "basic" reading, writing, computation, information gathering and analysis, and computer skills needed to work through the various steps. The team and group process skills addressed varied by work team as the needs became apparent, and the "basic" skills varied by individual workers within the teams. The instructors thus did ongoing assessments of what group or individual skill weaknesses impeded progress, and provided activities to overcome those barriers as needed.

The problems defined by the teams included:

- implementing the Kanban process (a specialized metals material flow process)
- reducing grease on plastic parts
- reducing waste from product falling from the process line
- cross-functional training
- developing a waste tracking system
- improving communications between shifts
- improving the materials supply system
- reducing excessive camber resulting in waste
- improving quality/reducing waste in a paper product
- improving the efficiency of the slitter machine
- improving internal team communications.

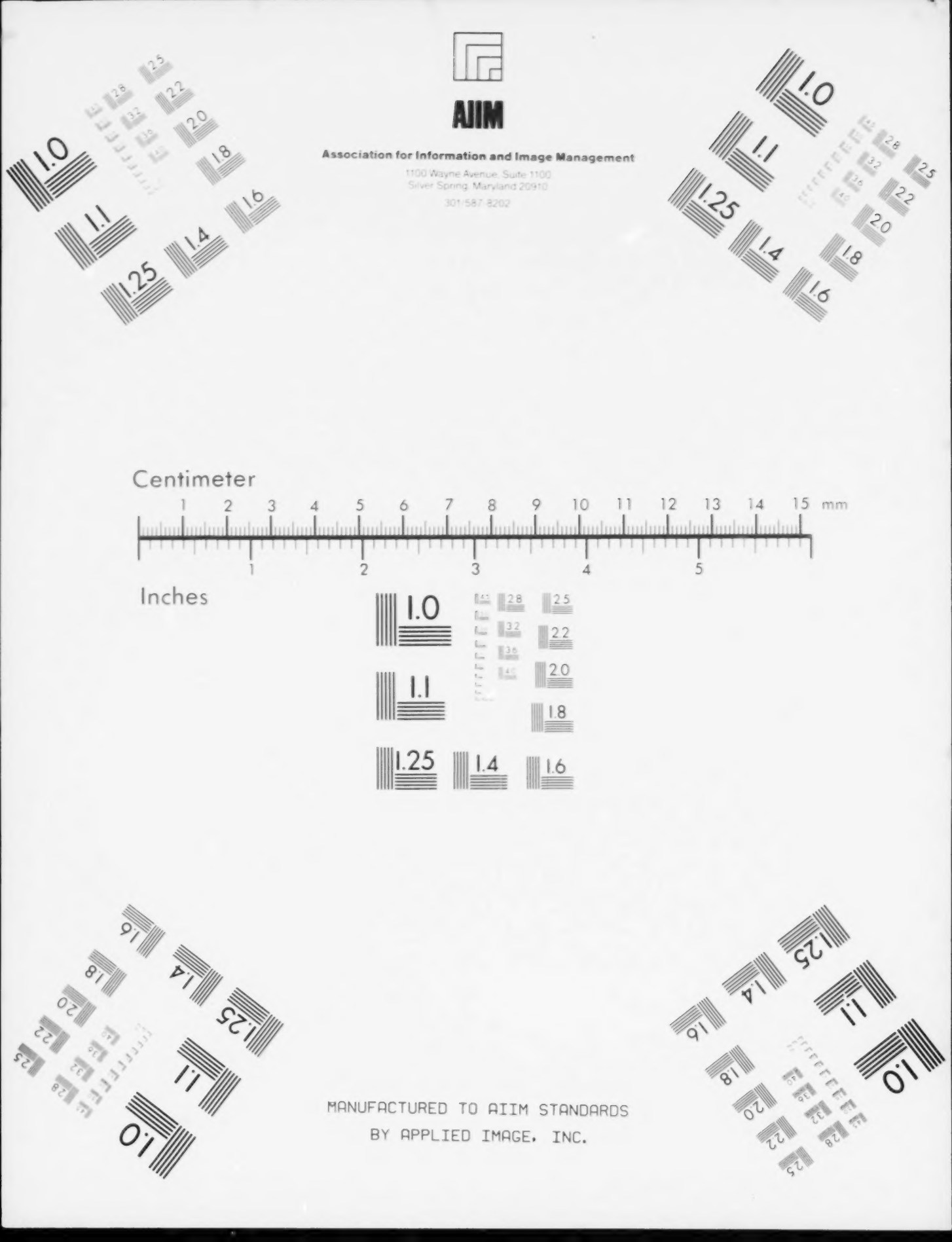
The solutions to the problems varied, with some focusing on developing new processes, others refining existing processes, and still others involving purchase of new equipment.

As one example of a solution, one team worked on reducing waste from the product falling from the process line. In the class the team developed and researched the feasibility of a number of solutions. Their most workable one involved the purchase of new conveyor system. Their research indicated that it would require a $57,000 initial investment plus employee training. They documented an estimated $114,000/year saving in scrap, however, in a convincing enough manner that management did purchase and install the recommended system. As another solution, the team that worked on the improved tracking system focused on the temperature and humidity in the storage/holding area, for which they established a regular monitoring system. Management approved this system and its use yielded savings of $60,000 for the first nine months of 1997. In

a third area, the group developed a process to measure and track weekly defects resulting in waste dollars. Through this process the team was able to detect trends and establish corrective action, in this case with the raw material supplier. Longitudinal analysis of the defects show an average of about $1,700 per week in January 1997, tapering off consistently to about $140 per week by week 41 in October 1997.

One point that these examples illustrate is that management's involvement with the teams' courses was essential. The project leaders originally assumed that having some management representatives on the EPT would facilitate getting the teams' solutions to management for consideration. This was effective to an extent. As the teams' solutions took shape, however, and management became more aware of them, one team was invited to make a formal presentation of its progress to the management team as part of its formal meeting. The value to both management and the class participants became apparent. First, management was impressed with the work done on the problems and found that the teams' work provided important information to the managers. Second, by preparing formal presentations to management, for which all team members were "required" to do a part, the floor operators developed their formal communications skills and took steps in interacting with management. They noted that these interactions helped build their confidence, made them feel more empowered in the organization, and opened further communications in both directions between managers and operators. As a result, this process of formal presentations by the teams to management at its regular meetings became a formal part of the curriculum.

As described earlier, one of the needs that emerged from the teamwork/problem-solving courses was that of individuals desiring improvement in the basic skills of reading, writing and math. The RCS staff, in conjunction with Kodak staff, conducted an informal workplace task analysis to identify the types of reading and math skills required in the work areas of interested employees. Based on that analysis they designed classes in Reading for Understanding, Writing for Performance Appraisals, Writing for Workplace Success, General Math, Custom Math for the Specialty business unit, and Creative Approaches to Learning. A total of 84 employees participated in these classes. These Essential Skills classes met for four hours per week, for eight to 10 weeks depending on the class. The original plan was that each basic skills course would be customized for the business units of the class participants. Due to decreased grant resources in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the third project year, however, the EPT decided to offer the classes for members of several business units combined. Thus, the customization only extended to examples as applicable as possible to the class participants within a general treatment of the content.

The Essential Skills teachers worked as a team to develop a portfolio assessment process. They defined specific sets of objectives for each class, rubrics to measure students' performance, and representative artifacts to include in the portfolios. Mastery levels were defined in a four-category scale. They then assessed participants at the beginning of the course and at the end with both off-the-shelf and teacher-made materials. The pre-assessments directed the individuals' instruction and served as a baseline for comparison at a middle or periodic (depending on the teacher's preference) assessment in mid-course. The post-assessments then described the extent that participants achieved objectives or increased mastery during the course as well as a record of their needs for the next courses they might take. Where students volunteered the information, they used their portfolio assessment results as part of their employment performance records in their Employee Development Plans.

Results

The results of Kodak's CLCI program are examined in three areas: the workers, the workplace and the business commitment to worker education. The results from the teamwork/ problem-solving courses show a very high degree of participant satisfaction with the courses. Formally surveyed reactions to the classes generally indicate that 60 percent or more of the participants agreed with statements that the course objectives, usefulness, structure, instructor quality, relevance to work situations, and support on the job were good. Most of those percentages were actually at 80 percent or higher. The only areas receiving lower ratings were, first, not receiving enough pre-course information to know what to expect from the class, a feature that the project staff adjusted after the first round of courses, and, second, some of the courses meeting for too short a duration. From the essential skills classes, the partcipants' reactions were also quite positive, generally in the same range as those for the problem-solving courses. The only area receiving lower ratings was one math class not meeting at a convenient time, noted by over half the participants.

Worker outcomes in SCANS and related skills from the problem-solving courses were reported anecdotally through interviews the external evaluators conducted with samples of participants and with their Training Advisors and teachers a few months after they completed their courses. The overwhelming majority highlighted the increased teamwork, problem-solving and communications skills, specifically: how to "get ideas out," evaluate, analyze and prioritize them; formal understanding of teamwork and group process skills; taking leadership, initiative, and follow-through on "the floor" and with management; interacting with management; and organizing presentations and formally speaking at management meetings. Employees and supervisors reported that they work more collaboratively, being more aware of the strengths and weaknesses of other team members and supporting each other as needed. Awareness and attitude outcomes were reported: having increased confidence in themselves, paying more attention to on-line quality during production, feeling more empowered in the organization, and increasing their understanding of how engineering considerations and the business context of decisions relate to operators and their work.

Participants' learning in the basic skills classes were assessed by the portfolio assessment rubrics mentioned above. Objectives/rubrics were classified into one of four progressive levels. For both the Reading and the General Math classes, six of the 10 participants in each progressed to a higher level from the beginning to the end of the course, and four progressed within the level at which they began. For the Writing class, five of the nine students assessed progressed one level and four progressed within their entry levels.

Numerous changes directly attributable to the course products took place in the workplace, besides the generally increased skills of workers. White boards have been installed and are used in a number of production areas, the company's e-mail system is more extensively used, molds are now kept cleaner, production monitoring and tracking systems have been installed resulting in decreased waste, and a new conveyor system has been installed in one area to significantly reduce waste. As reported above, significant cost savings were realized in some areas. Finally, all parties reported that some dimensions of those employee skills listed above were being used regularly on the floor and that they have caused significant changes in the day-to-day manner of working and increased employee confidence.

The business commitment to worker education may not have changed in degree, for it was very high at the outset of CLCI. It has, however, changed in quality. The process modeled in CLCI has helped shape Kodak's strategy for workplace education; their Education Development Center has adopted the model for company-wide training. This reflects a significant step in the attainment of the project's first goal, to transfer the project's learnings to the entire company. Additionally, because of the perceived value of this type of training model, Kodak increased the central workplace education staff from two to six during the first year of this project. When the full-time program coordinator left the position for another within Kodak, however, they did not replace her. Near the end of the project, the business unit Training Advisors shared Workplace Education Program[1] feedback with the CEO. They also requested continued support for the effort through a proposal to the PCMD Management Team to fund a full-time Rochester City School person in the position. As of this writing, the Management Team is still considering the proposal as it develops its budget for the coming year.

Main Lessons from Kodak Project

Several features of Kodak's implementation of CLCI seem noteworthy and have likely contributed to its success. To begin, the corporate commitment to the program was strong from the start, either directly or indirectly. The company was on a steady course of continuing to develop team-based, "high performance" organization characteristics. The new CEO made a clear and very public commitment to employee training as a high priority. These features laid a firm foundation for the CLCI model, which contains many characteristics of high performance organizations. This commitment followed through to management levels below that of the CEO, enabling the managers to be represented as active participants in the EPT, to give priority to teams' presentations at management meetings, and to consider, and often approve, implementing teams' problem solutions. Finally, the commitment extended to money -- for the Training Advisors to devote substantial amounts of their time to the project, for participants to participate in training on work time for significant periods, and to expand the Education Development Center staff for this project and its offshoots.

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[1] Kodak's in-house name for the CLCI activities.

The management involvement was not without its difficulties. Those who were actively and regularly involved in the EPT sometimes felt that they had to struggle to gain or maintain the level of management involvement they believed was needed. There was a desire for more regular HR participation in the EPT. In addition, the internal project coordinator, though allowed to work full-time on this project, had a seat on the Management Team that was rarely utilized. At one point shop floor representation was evident in the EPT. However, that representation became more limited over time due to volume pressure on the shop floor.

Second, the company had already "adopted" a problem-solving model, which was perfectly appropriate to the CLCI intentions. Also, both Kodak's and the RCS's education staff seemed to be in philosophical agreement with the CLCI vision. Thus, the education partners had to expend little or no effort to persuade anyone to "buy into" or at least try the CLCI model.

Third, within the general parameters articulated by the CLCI vision for the curriculum, Kodak's PCMD customized it at each step of the way. This seemed highly appreciated by the participants and helped promote its success and impact on the workplace. Further, the staff adjusted to changing needs as the courses went on.

One key way in which they customized the problem-solving curriculum was to take the step of defining the problem (which often took three or four of the 10 weeks available during the first round), and completing this step in the work teams before the formal course got underway. Other suggestions, by the Training Advisors in particular, for ways to improve on the problem-solving classes in the future are to delimit the problem criteria, guiding participants to select problems that: a) are small enough to promote their successful solution, b) tie directly into the business unit's Business Strategy (especially, to work at solutions within the existing capital budget), and c) require outcomes measurable in cost terms.

A difficulty noted by some employee teams was that of selecting a problem which changes naturally during the course duration. For example, one group selected a faulty robot operation as the problem to solve. During the course, the robot kept breaking down, making the class's pursuit of solutions impractical. Another difficulty was that some problems chosen by teams were more social than technical and thus involved a relatively high degree of sensitive material. One example is the team that selected internal team communications as their problem. Another was the team with the job rotation problem, since a key issue here involved gender

differences in physical capabilities to do some jobs. Both worker participation and teacher facilitation were especially difficult in these classes, and some participants felt negatively toward future participation in such groups. These represent issues for Kodak to address if it continues with the curriculum, but are also pertinent for others who consider adapting the model.

Fourth, the project had very active and legitimized leadership from within the company, through the Workplace Education Initiative, a formalized Kodak effort. That a professional education employee was assigned full-time to this effort gave it legitimacy within Kodak. Keeping the EPT lively, active and focused on the goals was an ongoing effort which gave the project continuous momentum.

Two other areas of concern were the WNA and the portfolio assessments. There was question about the WNA's value as it was done. Some believe that the WNA, at least in modified form, needs to be conducted more frequently over the three-year period, for needs and company or business unit circumstances change during that time. Others question whether it needed to be as detailed and extensive as it was, pointing out that the problem-solving class participants and management defined the "real" needs.

With respect to the portfolio assessments, project staff were struck by the extensive training and development effort needed to learn and implement the process. Additionally, a persistent issue was the confidentiality of participants' portfolio information. The managers wanted access to the individual portfolios to use them in employees Employee Development Plans and to better direct business unit resources at the skill areas in need of improvement. The employees and teachers wanted absolute confidentiality, unless an individual class participant volunteered the portfolio results. The latter was the policy the project followed, but the issue may remain a live one for the future.